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WHOLE EARTH REVIEW

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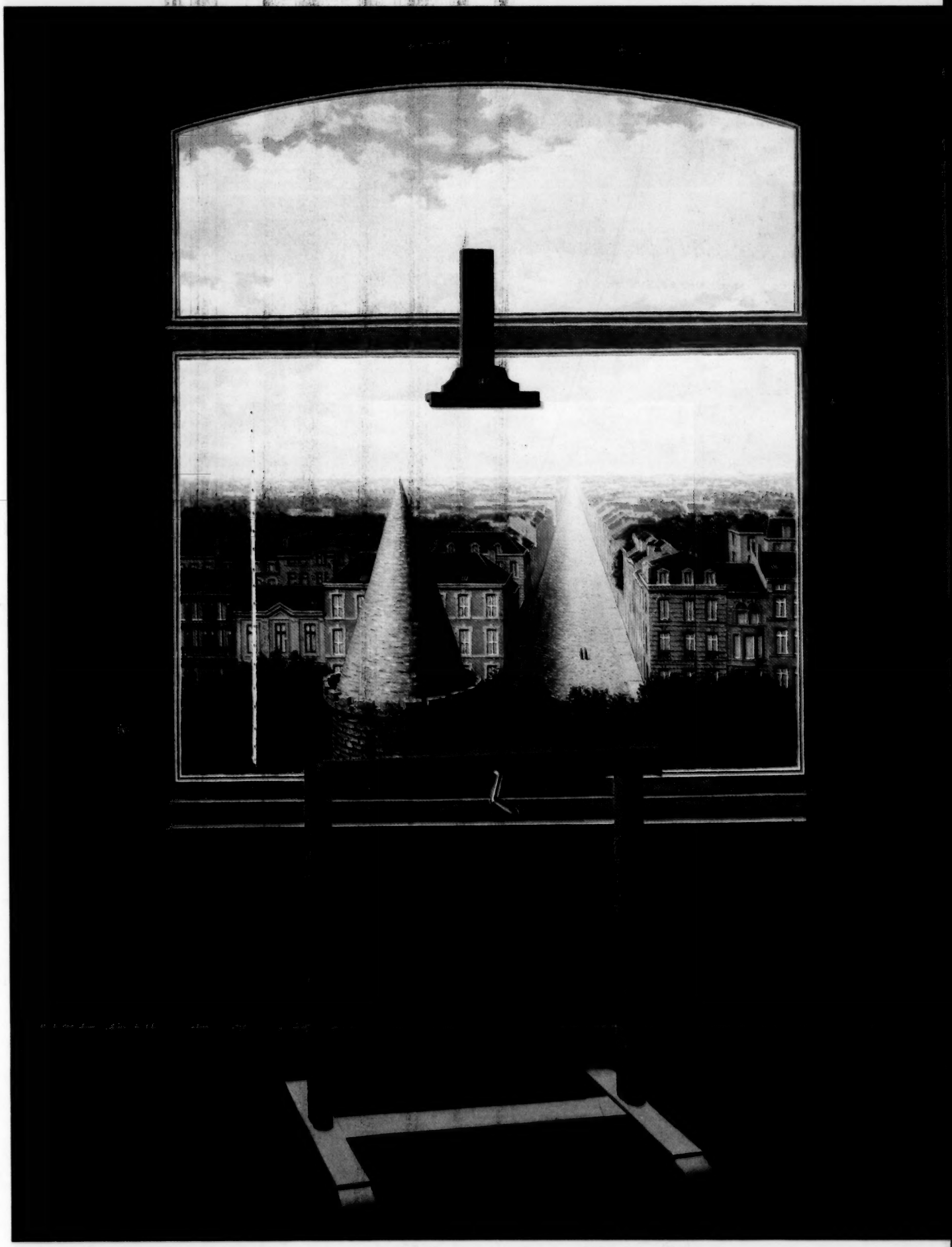

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Reality Club

JOHN BROCKMAN is a New York City literary agent and author. His books include **By the Late John Brockman** *(Macmillan, 1969),* **37** *(Holt, Reinhart, 1970), and* **Afterwords** *(Doubleday/Anchor Books, 1973) — cult books of the seventies, known for cryptic musings in areas ranging from cybernetics to post-modernism. (One typical page from a Brockman book has only the words: "Nobody knows and you can't find out.") He has been Whole Earth's literary agent since 1979.*

But Brockman also has a much less well-known distinction — he is founder of the Reality Club, a unique forum for challenging ideas such as those featured in this issue. John thought he could best explain the group in interview format, so as a fellow Reality Club member and **WER** *contributor, I got together with him on a cold February night at the Knickerbocker Restaurant in Greenwich Village. There, my tape recorder sat beside his steak dinner and my plate of pasta and recorded the following conversation.*

Well, not exactly. Reality seldom is so simple. What actually occurred was that the tape was transcribed and later edited and amended by John, J. Baldwin and myself in a spirit of accuracy and coherence.

—Steven Levy

Steven Levy: I think we'd better begin by explaining what the Reality Club is.

John Brockman: The motto of the Reality Club is "to arrive at the edge of the world's knowledge, seek out the most complex and sophisticated minds, put them in a room together, and have them ask each other the questions they're asking themselves." We hold free-for-all meetings once or twice a month, usually in New York. The evening consists of a talk or presentation by a speaker of about one hour to Reality Club members. The talk is followed by lively and often impolite discussion. We charge the speakers to represent an idea of reality by describing their creative work, life, and the questions they're asking themselves. We also want them to share with us the boundaries of their knowledge and experience.

SL: Who are these people?

JB: We have a simple criterion for choosing speakers. We look for people whose exceptional creative work has expanded our notion of who and what we are. In addition to the 14 contributors in this issue of *Whole Earth Review,* the 75 speakers have included psychologist Rollo May, zen master Richard Baker-Roshi, Abbie Hoffman, poet Michael McClure, essayist Annie Dillard, poet Gerd Stern, energy experts Amory and Hunter Lovins, Ellen Burstyn, Betty Friedan, computer scientist Edward Feigenbaum, plant physiologist Rupert Sheldrake, physicist Fritjof Capra, religious historian Elaine Pagels, anthropologist-shaman Michael Harner, director Richard Foreman, gerontologist Roy Walford, sociologist Sherry Turkle, and Stewart Brand.

SL: How did the Reality Club get started? What led to this thing happening?

JB: James Lee Byars, the conceptual artist, and I used to spend a part of every day walking in Central Park. He had a very interesting theory that reality was something you took off the tongue. I was intrigued with the idea that the words of the world are the life of the world. And that nature is not created, nature is said. Reality is a process of decreation. It's what people say it is. The world, the world that we know, is not necessarily out there, it's invention — human invention — an invention created by a finite number of people throughout history. I thought it would be interesting to track such people living today and find out what they're thinking about.

SL: When did you come up with the idea of meetings?

JB: In the mid-'60s, Dick Higgins of the Something Else Press invited me to a series of weekly meetings with the composer John Cage. Cage was interested in meeting young people in New York. The evenings had no particular agenda, it was simply Cage leading a discussion. Everyone in the room was erudite, filled with intellectual hunger, intellectual desire. Most of them went on to brilliant careers.

The sessions were held at Higgins' town house in the Chelsea area of New York. Cage would throw out some ideas and the talk would go around the room. Cage had an idea, which is mentioned in one of his books, that there's *one mind* — the one we all share. An idea could bounce back and forth across the room without ownership and yet have a life of its own and an evolution in and of itself.

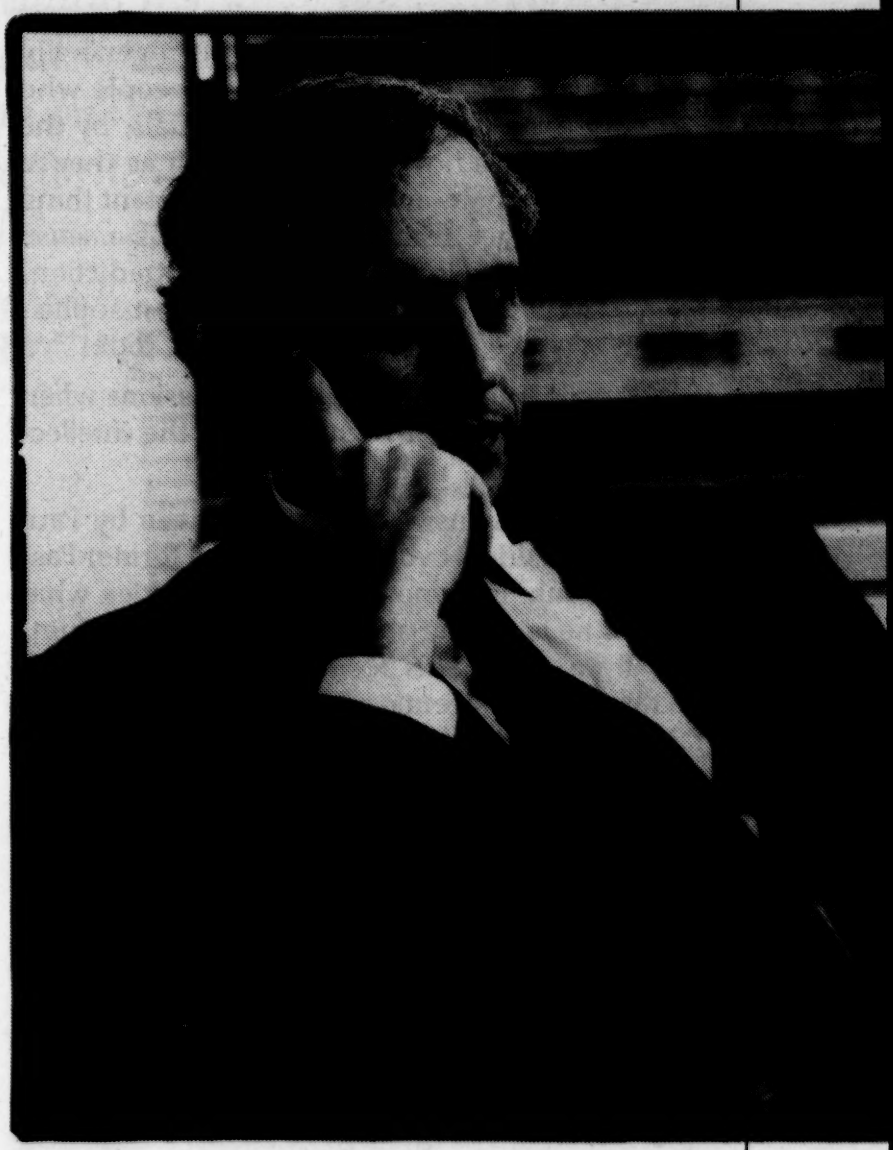
Soon after, I began assembling my own evenings of avant garde artists, writers, sculptors, and poets to meet in an unscheduled, haphazard way at my apartment. No agenda, except to be in the presence of each other's intelligence.

Simultaneously, I was grappling with certain issues and ideas which were changing my own way of thinking. I was turned on to J. Z. Young by McLuhan. Young's idea was that man creates tools and then molds himself in their image. To me, this indicated that reality is manmade. The universe is an invention, a metaphor.

SL: It's rare to have a forum to consider these topics, unless you're in a university setting or something.

JB: Right. I find that in New York, there are very few opportunities to sit down with people and discuss ideas in a rigorous manner. Most interactions are either social or business, and it's a rare occasion and special treat to be able to sit down with people who are your equals and seriously discuss what you've been thinking about. It's funny you mention academia because my vision for the club — which I finally semi-formalized in 1981 to the point of calling it The Reality Club — came as a reaction to that. I remember I was on a long car trip with Katinka Matson, and I described to her what I thought was a witty idea for a club for the bright people I knew — most of whom were unable to get in any kind of club, fraternity, or sorority in school because of their brains. This club would have its own club jacket, motto, and exclusive membership. And the name, of course, was a pun. Anyone who has read my books understands that my goal was to pose a challenge to contemporary ideas of language, thought, and reality. But the joke was on me. People took it very seriously, and still do. People like you, Steven. Facts smirk.

I was intrigued with the idea that the words of the world are the life of the world. And that nature is not created, nature is said. Reality is a process of decreation. It's what people say it is.



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The probably real John Brockman.

SL: How do you become a member of the Reality Club?

JB: If you give a talk, you're a member.

SL: How do you pick who talks?

JB: Finding the speakers is a word-of-mouth enterprise. Quite often it simply comes down to people who interest me. Or a member will call or talk to me during a meeting and suggest someone they are interested in hearing. There is no selection committee. ►

I believe that a tiny minority of people in the world do the significant thinking for everyone else.

Very few of our speakers are bestselling authors or famous in the mass culture. It's my feeling that once someone achieves such status, often he or she is no longer worth listening to. I'm much more eager to hear ideas that have not been generally exposed. I am particularly drawn to people who can tell me I'm wrong. Most individuals, by the time they're 30, know almost as much as they're ever going to know, and the most important thing that they can get from another person is a sense of awkwardness, confusion, and contradiction. How do you live on the edge of the most sophisticated awareness that exists? Play the fool.

SL: Do you remember any specific occasions when someone in the Reality Club pulled the intellectual rug out from under you?

JB: Many occasions. I recall a talk given by Paul Ryan, our resident cyberneticist and a former Passionist monk. Even now, I still have no idea what the hell he is talking about, but listening to him, verbally assaulting his positions and in turn being decimated by his gentle and Jesuitical intellectual Tai Chi, ranks as one of my life's memorable experiences.

Another evening, I attempted to ask Lynn Margulis what's the point of talking about events which supposedly happened three billion years ago, i.e. how can the human mind even comprehend the idea of three billion years. As I recall, that was the last word I got in.

It's also not uncommon for a speaker to leave a meeting feeling like chopped liver, although the spirit of the meetings is good-natured and fun. One speaker who had been working on a paper for two years met with a hostile barrage of highly critical and yet well-founded comments. He had put his life into his new theories, and I wondered how he would handle the negative response. The next day he called to tell me that the evening was a very useful experience as he had been working in intellectual isolation and was grateful for the opportunity to test his ideas out on a peer group. People with a deep knowledge of his field had wanted to set him right.

I think it's good that a speaker can't get away with loose claims. Maybe a challenging question will come from someone who knows an alternative theory that really threatens what the speaker had to say. On the other hand, someone might come up with a great idea totally out of left field that only someone *outside* the speaker's field could come up with. I think that's a really interesting dynamic.

SL: Do you have to work at keeping membership interdisciplinary?

JB: I work very hard at it, so much so that about a year ago, I diagnosed myself as having an advanced case of "founder's disease." Heinz Pagels stepped in and has provided us with the Council Room of the New York Academy of Sciences as a meeting place. Heinz hosts the evenings. The results have been energizing. Heinz has brought in some new blood.

SL: Alternatively, sometimes there's a problem in keeping people *out* of the Reality Club. I'm talking about the no-spouse rule.

JB: Our meetings are not social gatherings. No spouses, dates, children or friends. This guarantees our speakers an opportunity to present their ideas to a group of creative peers.

SL: Some people might read this and ask, "What kind of an elitist gang is this?" Is the Reality Club elitist?

JB: The Reality Club encourages people who can take the materials of the culture in the arts, literature, and science and put them together in their own way. We live in a mass-produced culture where most people, even many established cultural arbiters, limit themselves to second-hand ideas, thoughts, opinions. The way this culture is going, most Americans are the mental equivalent of shopping malls. I believe that a tiny minority of people in the world do the significant thinking for everyone else. We are elitist if that is construed as a group of people who create their own reality and not an ersatz reality. Our members are out there doing it rather than talking about and analyzing the people who are doing it.

SL: I notice there are never any tape recorders at the Reality Club, even though, in the couple years I've been going, I've heard some amazing people and sometimes wondered, "Why isn't this being preserved?" Not only the presentations, but sometimes the great discussions coming afterward.

JB: A number of the members feel that they'd be inhibited by having tape recorders present or the press in attendance. The Reality Club is a place where they can let their hair down, have some fun.

As a matter of fact, you are one of the few journalist members. Just try writing about the Club and see what happens to your reality. It's understood that no one is going to write about details of specific meetings.

SL: If privacy is such a concern here, why have you decided to do a "Reality Club" issue of *Whole Earth Review*?

JB: That's a good question. We have not sought any publicity and yet a lot of people have been raising questions about the club, and media people have been calling and expressing interest in doing articles. And it occurred to me that if the word were to get out to the public about our activities, I'd rather have the channel be an audience that appreciates the ideas represented. So when the invitation from *Whole Earth Review* came, I decided to accept.

SL: How would you tell people to go about making their own Reality Club?

JB: You mean franchising? That is a very *Whole Earth Review* kind of question.

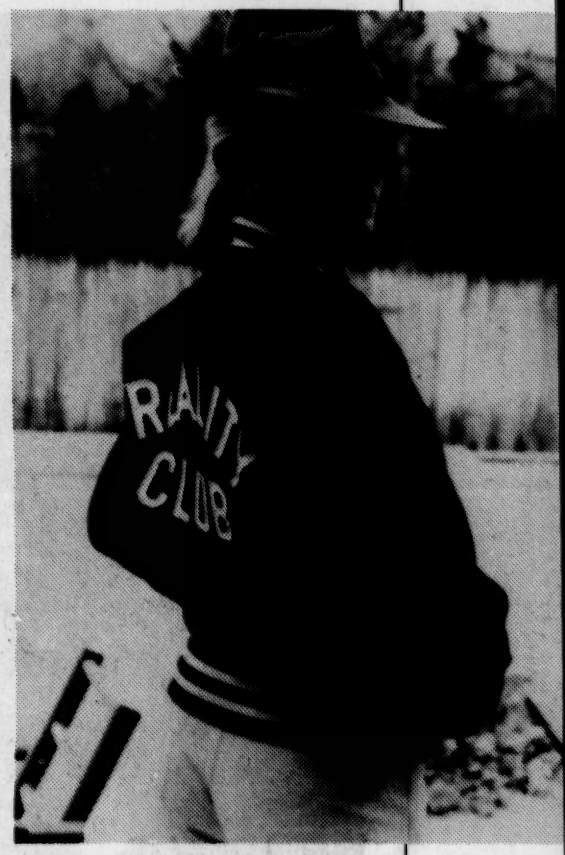
SL: When people get out of college, a lot of them don't discuss ideas any more, though they might like to.

JB: The idea of having a Reality Club in every little town is not feasible. The Reality Club is not for everybody. I remember 15 years ago, talking with Gregory Bateson who was at that point lending his name and presence to organizations that had no real interest in or understanding of his epistemological endeavors. He pointed out that in the United States there was no university with a department of epistemology and there was no place for someone to make a living as an epistemologist. About that time, I flew to California just to sit and talk with him. He was giving a weekend seminar at John Lilly's place. About 20 people gathered to hear him for a full day in beautiful, sunny California weather. By 2:00 in the afternoon, half of them were lying down asleep. I mean sound asleep. They weren't interested. The number of people who desire to explore the epistemological rhythmics of human thought is relatively small.

SL: How do you get people to ask the questions that they're asking themselves rather than give canned presentations? Sometimes people will give what is obviously not the question they're asking themselves but questions they feel they've already answered. Those, to me, are the least successful presentations.

JB: In communications theory, information is not defined as data or input but rather as "a difference that makes a difference." It's this level I hope the speakers will achieve. You know the evening is a failure when instead of piercing questions and critiques, the speaker gets only polite smiles and accolades. I want speakers who are willing to take their ideas into the bull rings.

Just try writing about the Club and see what happens to your reality. It's understood that no one is going to write about details of specific meetings.



Katinka Matson models jacket.

SL: For a while you were talking about plans for a Reality Club library. What happened to that?

JB: I want to find a permanent home in New York City for the Reality Club and an appropriate library. The Reality Club is not incorporated, has no budget, has no dues, has no speaker payments. It runs on pin money. Usually my pin money. But I believe in change, especially if it means I can retire as chief donor. We are open to the possibility of funding from a foundation or philanthropist.

SL: So what can we expect from reading this issue of *Whole Earth Review*?

JB: The articles presented in this issue are representative of Reality Club talks. All the contributors have spoken before the Club and in some cases the articles are adaptations of the talks. They explore the edges of thought in different disciplines.

SL: Do you think one day the Reality Club will be a legend like the Algonquin, the Apostles, the Bloomsbury Group or the Club?

JB: Nobody knows and you can't find out. The Reality Club is different from these groups, but offers the same quality of intellectual adventure. I am happy to report that the mind is alive and well on East 63rd Street. ■

Drawings by William Blake/Assemblage by K. O'Neill

Heinz R. Pagels talked to the Reality Club about "Perfect Symmetry" at The New York Academy of Sciences on March 19, 1981. Heinz is a high energy physicist, adjunct Professor of Physics, Rockefeller University, and executive director, The New York Academy of Sciences. He is also the publisher of The Sciences *magazine, in which this article first appeared.* —*John Brockman*

A Cozy Cosmology

The Anthropic Principle Is Convenient, But It's Not Science

BY HEINZ R. PAGELS

THE UNIVERSE, it seems, has been finely tuned for our comfort; its properties appear to be precisely conducive to intelligent life. The force of gravity, for example, could hardly be set at a more ideal level. If it were somehow adjusted upward by just a bit, the stars would consume their hydrogen fuel much more rapidly than they now do. Our sun might burn itself out in less than a billion years (instead of ten billion years), hardly enough time for life as complex as the human species to evolve. If, on the other hand, gravity were nudged downward a notch, the prospects for the evolution of intelligent life would be no less bleak. The sun, now burning more slowly, would cool down and become much too chilly to sustain life as we know it.

The ratio of photons (particles of light) to nuclear particles (protons and neutrons) also falls within a most convenient range. In Einstein's gravity equations, which describe the laws that govern the evolution of the universe, this ratio plays a critical role in determining the rate at which the cosmos expands. If the ratio were forty billion to one instead of four hundred million to one, the universe would expand so rapidly that stars and galaxies might not have formed, in which case there would be nowhere for life to live.

Yet another quite convenient characteristic of the universe has to do with the relative masses of protons and neutrons. The neutron is ever so slightly the more massive of the two, and so free neutrons — neutrons not confined in atomic nuclei — can, and do, decay into protons. If we could alter the masses of these subatomic particles by a small fraction of 1 percent, we could make the proton the heavier. Hydrogen atoms, in this imaginary universe, would then be unstable, since the protons that constitute their nuclei would spontaneously decay into neutrons. Hydrogen (which comprises about 74 percent of the observed matter in the universe) could not exist — and thus, presumably, neither would the stars that consume it nor the life that basks in the resulting glow.

Similar examples abound. Again and again, scientists have been struck by the observation that if a given characteristic of the universe were only slightly different, then life would be impossible. Some physicists have come up with an explanation for these many instances of good fortune. It is possible, they argue, that any number of the many alternative universes we can imagine — places with stronger gravity, or weightier protons, than our universe — actually exist. But, because they are not conducive to life, there are no physicists or philosophers in these universes to contemplate them. Thus, the physical properties we observe are the properties of a specially selected stretch of time and space — one that spawned life; so, the compatibility of these properties with life is hardly surprising. As the physicist John D. Barrow has put the proposition: "The observations of cosmological parameters made by astronomers are the victims of an all-embracing selection effect — our own existence." This line of argument has been given a name: the anthropic principle.

To judge from the present flow of books and magazine articles, one would think that the anthropic principle is sweeping through science like wildfire. Barrow and the astrophysicist Joseph Silk give it serious consideration in their recent book, *The Left Hand of Creation. The Anthropic Cosmological Principle,* coauthored by Barrow and the physicist Frank J. Tipler, gives by far the most extensive account of these ideas. *Stephen Hawking's Universe,* a book published in 1984, devotes a chapter to the repeated use of the anthropic principle by Hawking, the British cosmologist who has done so much to bring the current theory of the cosmos into being. Paul Davies, another British cosmologist and a quantum field theorist, wrote about the principle nine years ago in *The Sciences* and, more recently, discussed it in the English

popular magazine *New Scientist*. And only three years ago, a novel application of the principle was the subject of a generally favorable editorial in the esteemed British journal *Nature*.

My own view is that this is all much ado about nothing. The anthropic principle is deeply flawed and has no place in physics or cosmology. Although billed by its proponents as a major principle, it in fact makes no progress toward solving the great mysteries of the universe. Indeed, it confronts us with a new mystery: how can such a sterile idea reproduce itself so prolifically?

THE ANTHROPIC LINE of reasoning can be traced back at least as far as 1955, when the mathematician G. J. Whitrow, of Imperial College, London, published an article, in *The British Journal for the Philosophy of Science*, in which he contended that the reason we find the universe to be three-dimensional is that life could not exist in other dimensions. The Princeton physicist Robert Dicke, however, was the first to articulate the anthropic principle clearly. In a 1957 article in *Reviews of Modern Physics*, he suggested that the fundamental physical constants, such as the gravitational constant and the charge on the electron, are "not random but conditioned by biological factors," central among them the fact that organisms must exist in order for these constants to be measured.

In the nearly three decades since Dicke's paper was published, a number of scientists have invoked the anthropic principle in their writings. But it is often not clear how strongly they believe in it, and whether they aren't simply using it (with some success, admittedly) as a kind of intellectual tease. More often than not, the principle is described in forceful and intriguing terms but either not endorsed or given only the faintest embrace.

A noteworthy exception is the position of Brandon Carter, an English cosmologist. Since 1974, when he coined the term "anthropic principle," he has been one of the principle's strongest advocates. He sees it as providing a middle ground between the pre-Copernican view, which saw the universe as being centered on humanity, and the post-Copernican view, which denies humanity *any* cosmological status. "Although our situation is not necessarily central," Carter has written, "it is privileged to some extent." The anthropic principle, he believes, has at last put our position in the universe in proper perspective.

In some respects, though, Carter's worldview is the product of an anthropocentricism as profound as that which underlay the pre-Copernican view of the universe; the anthropic principle is born of a most provincial outlook on what life is. Its adherents assume that all life must resemble, in broad form at least, life on this planet.

The annals of science fiction suggest how mistaken this assumption could turn out to be. The English astronomer Fred Hoyle (who, ironically, was among the first to cite the anthropic principle) has written a story in which intelligent life exists as a cloud of gas. The sun itself, according to another piece of science fiction, may be intelligent, but so slow in its thought processes that no mental gyrations are apparent to us. By exercising this much imagination, we can see how a universe with stronger or weaker gravity, or a different ratio between photons and nuclear particles, could produce forms of intelligence that bore no resemblance to life as we know it. If the scientists among such beings applied anthropic reasoning, they would probably conclude that a universe like ours could not give rise to life because its fundamental constants do not agree with theirs.

Whether applied by extraterrestrial (or extrauniversal) beings to rule out our existence or by us to rule out theirs, the anthropic principle is an unscientific idea; it uses the unknown (life and the forms it *might* take) to explain the known (the observed properties of the universe) rather than the other way around. As such, the anthropic principle never *predicts* anything — not the appearance of a comet, nor the outcome of a laboratory experiment; it is, as the astrophysicists Bernard J. Carr and Martin J. Rees, both then of Cambridge University, noted in *Nature* several years ago, "entirely *post hoc*." What's more, unlike other principles of physics, the anthropic principle is not testable. It is all well and good to imagine universes with various gravitational constants and estimate the prevailing physical properties, but there is no way we can actually go to an imaginary universe and check for life. We are stuck with our universe, and powerless to alter its fundamental constants. So long as this is the case, the anthropic principle will be immune to experimental falsification — a sure sign that it is not a scientific principle.

A GLANCE at recent scientific history demonstrates how utterly the anthropic principle fails to shed light on the nature of the universe. In 1973, Hawking and Barry Collins, both of Cambridge University, published a paper addressing the isotropy of the universe — the fact that it looks much the same in all directions. The galaxies, for example, are evenly distributed over the entire sky, not lumped

into one place, and the microwave background radiation (the heat left over from the primordial big bang) is also equably spread across the universe. Hawking and Collins argued that out of all the possible initial conditions of the universe, only a small set could produce such isotropy. To explain this seemingly improbable circumstance, they invoked the anthropic principle. Since in highly anisotropic universes matter would never form into galaxies, stars, and planets, life (at least as we know it) would have no place to reside. So, we should not be surprised to peer out and find that our universe is isotropic. If it were not, there would be no one to do the peering. There is nothing wrong with this reasoning. But is it necessary? Aren't there better ways for scientists to spend their time?

As it turns out, there are. Scientists who devoted their energies to finding a more conventionally scientific explanation have arrived at a theory that many cosmologists now subscribe to; the big bang, they believe, was preceded by something called the inflationary epoch, which can be well represented by the image of a balloon being blown up. Initially, the balloon may be wrinkled and twisted. But, upon inflation (an exceedingly rapid inflation, in the case of the nascent universe), its many inhomogeneities get "stretched away." The result, we believe, was a uniform space for the universe and a uniform distribution of the matter in it. If this idea is correct, then Hawking and Collins's application of the anthropic principle was simply unnecessary.

In this application, the anthropic principle assumed the milder of its two forms; it was used to account for an observed property of the universe, but not for the fundamental constants — the force of gravity, the neutron-proton mass ratio, and other precisely defined quantities that figure critically in the mathematical foundation of physics. Stronger versions of the principle — attempts to explain the fundamental constants themselves — have been no more fruitful. Take, for example, the ratio of photons to nuclear particles, which partly determines the rate at which the universe expands. Over the last several years, this ratio has been explained by both the inflationary universe hypothesis and the new unified field theories (theories that account, within a single framework, for three of the four basic forces, such as electromagnetism and the "weak" and "strong" interactions of subatomic particles). So, this constant is more profitably viewed as a consequence of the laws of nature than as the legacy of some selective principle.

Such constants are often called "arbitrary" — not because they lack a precise numerical value (that can be determined by experiment) but because physicists have not yet devised a theory to explain them. We know of no reason, for example, why the gravitational constant couldn't have another value. This arbitrariness is distasteful to theoretical physicists because it highlights their failure, as yet, to provide an exhaustive explanation for the physical structure of the world. They would like to believe what Einstein said: "There are no *arbitrary* constants. . . . Nature is so constituted that it is possible logically to lay down such strongly determined laws that within these laws only . . . completely determined constants occur."

Although the master theory that would reduce the number of arbitrary constants to zero continues to elude physicists, they are making progress toward it. The recently developed superstring theory is an attempt in this direction. Only two decades ago, the equations of particle physics included dozens of unexplained parameters, but the electro-weak unified field theory of the early 1970s showed that virtually all of them follow from the laws of physics. Today, there are only about nineteen arbitrary constants in the physical laws that describe nature at the microscopic level. If science continues to dispel our ignorance at the present rate, the anthropic principle will soon be relegated to its proper role: as a museum piece in the history of science, gathering dust.

A FEW years ago, at a dinner honoring the physicist Eugene Wigner, I encountered Robert Dicke, who was a teacher of mine during the late 1950s, about the time he first endorsed the anthropic principle. After all these years, I asked, what was his view of the idea he had helped put on the map? Dicke said he now thought that unless there was an element of arbitrariness in the origin of the universe, the anthropic principle was without content. His point was this: if the physical laws prevailing at the birth of the universe fixed the fundamental constants in cement, then anthropic reasoning is unnecessary; the universe is completely determined, and the question of whether life can evolve was answered from the beginning; even if there were billions of distinct and separate universes, they would all be basically the same, assuming that the same set of laws governed the origin of each. But if there is some randomness in the way the fundamental constants are set, then there could be universes that, though created in accordance with the laws that reign in our universe, differ from it fundamentally. In that event, Dicke believes, then indeed the anthropic principle is worthy of consideration. ►

Dicke's remark echoes Einstein's comment that he worked on physics to find out "if God had any choice in creating the universe the way He did." Physicists still do not know whether such "choice" existed, but some believe that the theory of quantum mechanics leaves room for it. The origin of the universe, they argue, involved quantum processes, which determine the probability of individual events but not the events themselves — just as the probability of the outcome of a given throw of the dice is determined by reliable statistical laws but no single outcome can be confidently predicted.

If these physicists are right — and, further, if there are many such universes, all created in accordance with laws that leave room for randomness in the fundamental constants — then the anthropic principle makes *some* sense: the fundamental constants may differ from one universe to the next, and some universes, unfit for habitation, may represent lethal throws of the quantum dice.

But how likely is such a scenario, and how will we ever know for sure if it is correct? Moreover, even if we accept the notion that random processes played an important role in the creation of the universe, it does not follow that the fundamental constants in any other universe differ from ours. The differences may be more superficial — a slight variation, for example, in the distribution of galaxies and stars. My own view is that although we have not yet discovered the most basic physical laws, if we do, the possibility of life in a universe governed by those laws will in some sense be written into them. The existence of life is not a selective principle acting on those laws; rather, it is a consequence of them. Whether or not I am right, it is simply premature to invoke the anthropic principle until the origin of the universe is much better understood.

Why, in the meantime, do some scientists continue to honor the anthropic principle with their attention? At least part of the answer is beyond the reach of scientific analysis, and lies somewhere in the realm of personal taste and individual psychology. Still, we can speculate. Perhaps the frustration and exasperation intrinsic to searching for a complete account of the cosmic parameters have gotten the better of some physicists and cosmologists. And, certainly, the anthropic principle's simplicity accounts for some of its appeal, particularly to the growing number of scientists who write for a popular audience. It is easier to convey a simple redundancy — that we can only see what we can see — than to grapple with the abstract mathematical arguments following from the unifield theories. In many respects, the anthropic principle is the lazy man's approach to science.

Superficially it might seem that the anthropic principle has something in common with the Gaia hypothesis put forth by English biologist James Lovelock, because both ideas make statements about the singular importance of life. The Gaia hypothesis states that life on Earth did not simply respond to the environment in which it found itself, but actually helped to create and modify the entire planetary environment (such as the production of atmospheric oxygen). Stated broadly, the Gaia hypothesis holds that the planet is an ecological unity, an organism. This view creates a new categorical framework for our thinking about the connection of all living things to the Earth. More specifically, the scientists supporting the Gaia hypothesis show how it can be used to deduce definite statements about the evolution of life — statements which can be shown through empirical evidence to be true or false or require modification. The Gaia hypothesis is testable and as such commands the attention of ecological and evolutionary scientists. And therein lies its principal distinction from the anthropic principle — the Gaia hypothesis is testable, while the anthropic principle simply is not.

Furthermore, the Gaia hypothesis lends itself to a research program — an ongoing activity of scientists to see if this grand idea makes any sense. It is an idea that is intellectually fertile and can open new ways of thinking, unlike the anthropic principle that leads nowhere. An hypothesis has to be *needed* to be advanced. The Gaia hypothesis may fill an important gap in our thinking about evolution; the anthropic principle, by contrast, fills no such gap in our thinking about cosmology.

In fairness, it should be noted that those who appeal to the anthropic principle are not seeking in it a *causal* explanation of universal properties; they do not contend that the existence of life causes the constants to have their observed values. As Paul Davies has put the argument: "[Anthropic] reasoning so far, while compelling, does not really *explain* the large-scale features of the universe so much as *constrain* them. It is only possible to say that if they differed markedly from what we observe we would not be here to wonder about it."

Do Davies's words punch a hole in my argument? If the anthropic principle is not explanatory after all, then it is, strictly speaking, not competing with the conventional program of scientific explanation. True enough. But the fact remains that the anthropic principle is an alternative approach to thinking about the mysteries of the universe, and in that respect detracts from real science. Physicists who dwell on it are, in effect, giving up on the attempt to find a truly fundamental explanation for the nature of things. The anthropic principle is needless clutter in the conceptual repertoire of science.

There does exist a line of thinking that *is* in direct competition with the anthropic principle. Edward Harrison, in his textbook *Cosmology*, advises his readers early on: "We shall occasionally refer to the anthropic principle, and the reader may, if it is preferred, substitute the alternative theistic principle." The theistic principle is quite straightforward: the reason the universe seems tailor-made for our existence is that it *was* tailor-made for our existence; some supreme being created it as a home for intelligent life. Of course, some scientists, believing science and religion mutually exclusive, find this idea unattractive. Faced with questions that do not neatly fit in the framework of science, they are loath to resort to religious explanation; yet their curiosity will not let them leave matters unaddressed. Hence, the anthropic principle. It is the closest that some atheists can get to God. ■

POEMS *BY ROBERT PACK*

NUMBER

The nothingness "before" the creation of the universe is the most complete void that we can imagine — no space time or matter existed. It is a world without place, without duration or eternity, without number. . . . Yet this unthinkable void converts itself into the plenum of existence — a necessary consequence of physical laws. Where are these laws written into the void? What "tells" the void that it is pregnant with a possible universe?

—Heinz Pagels, *Perfect Symmetry*

Mothering void, ripe emptiness,
pregnant with number — *one*,
the number first of all for the duration
each of us enjoys beneath the sun,

our single sun, and yet a minor star among
such billions in the Milky Way,
I thank you for one lifetime
being what I am before the day

I separate into more stable particles.
I give thanks, too, for *two*,
the other by which one conceives oneself as one,
apart, and yet a part of you,

O void unthinkable, your child of place —
this cooling quantum mess
of hydrogen and helium, of chairs and cats,
your unknown law of nothingness

converted to the plenum of existence like
the animals from Noah's ark
who clump the ramp boards, bumping on their way
where light breaks through the fertile dark.

We two together now in thought,
Professor Pagels, let's give thanks to *three* —
perhaps three apples in a bowl,
or, in a cherry tree,

three calling birds whose random voices
blend within the mind
and on their branches make a triangle
should I elect to find

a pattern there. To meet my need,
another bird alights,
an oriole, and lo!, a rectangle appears,
as though the summer nights

the constellation, Leo Minor, guards
my dreaming house, accompanied
by five-starred Lyra's harp chords in the wind
while multiplying numbers breed

their imagined offspring in the womb of sleep.
So I recite myself among
the stars, the crystal hexagons of snow,
electrons, protons — each one sung

for its own numbered self to celebrate
possible matter, time and space,
including me to think of the unthinkable,
to give the pregnant void a face

(only a while, a nanosecond measured
even by our finite sun)
yet long enough to call her mother, long enough
to count
from zero up to number one. □

Robert Pack read "A Packet of Poems for Professor Pagels" at a meeting of the Reality Club in my living room on March 15, 1986. Bob is a poet, the director of the Breadloaf Writer's Conference, professor of English at Middlebury College, and author of The Irony of Joy *and* Faces in a Single Tree *(Godine, 1984).*

—John Brockman

EINSTEIN

After 1926, Einstein...lost contact with the "old One" and the creative physical intuition he possessed for more than twenty years. The delicate balance between innocence and experience, prerequisite for creativity, tipped toward experience. As [one] physicist said when he heard of Einstein's opposition to the new quantum theory, "We have lost our leader." Einstein held the classical view of determinism to the end of his life. For him, it was unthinkable that there was arbitrariness and chance in the fundamental structure of the universe. —Heinz Pagels,
The Cosmic Code

Yes, one needs innocence to be
in contact with the "old One," hearing Him
assert His order in the image
of a burning bush. And cosmic whim

as arbitrary chance —
the fundamental structure of uncertainty
throughout the universe — that, too,
takes innocence to see,

like youthful Einstein's "glucklichste Gedanke
meines Lebens," his life's happy fate
to think that an observer falling freely will
not feel his body's weight;

compared with other falling bodies, he'll
perceive himself to be at rest.
Like Moses humbled by amazing flames,
ecstatically possessed

by his Creator's "I AM THAT I AM,"
Einstein envisions light that bends
in a straight line, since finite space is curved,
and thus he comprehends

that gravitation is geometry!
Oh, in holy wonder, *how*
all matter moves within a space-time warp
reveals its law to him; he now

knows gravitation is equivalent
to increased motion: where we live,
our restless place of earthly rest, our home,
and where we go, are relative.

Newtonian experience, he still insists,
shows all events must have a cause,
and so the "old One" turns
away from His own chosen son; in that dim pause

the age of randomness is born.
The "old One" shakes His head,
while at the quantum border of uncertainty —
"We've lost our leader," someone said.

Barred from the promised land —
in which all forces might be unified
within a single law —
his strict faith held until he died;

he loved Mozartian serenity, and yet
would not take morphine for his pain:
"I want to go when *I* want . . . "
Einstein argued with the void. His eyes remain

a light to us — although
his nurse reported she had heard
but couldn't, at his death bed, understand
his muttered, final German word.

PEPPER AND SALT

To illustrate entropy increase take a glass jar and fill it up a quarter of the way with salt. Then add granulated pepper until it is half full. There is a black layer on top of a white layer — an improbable configuration of all the particles. . . . Now shake the jar vigorously. The result is a gray mixture, a disorganized configuration of the salt and pepper. If you keep shaking it is very unlikely that the original configuration will ever return. Not in a million years will it return. —Heinz Pagels,
The Cosmic Code

With just two shakes of the glass jar — *voila!*
the scattered pepper
organizes to the top,
salt burrows underneath; a blurred

reflection of its crystal whiteness
merges with the oak grain on the oval table
by the east-view window where I sit.
One daffodil

is leaning from a glazed, green vase;
it shimmers moistly
though I cut it days ago, nor is there
change of heart in me,

watching the cow-faced sun lift up
its head to graze
over the hazy mountains
twenty miles away. Shadows of pear trees

leap across the lawn now sparkling
with the beaded dew;
a phoebe dips her tail and darts off
toward the nest she built two years ago.

My sleeping father,
visiting my house, may well be dreaming he
has come back to the farm
where he was born; his father might be me

lacing my work boots on.
Only the coffee's taste is true,
only the lemon light across the hills
right now, right now, and you,

Professor Pagels, in my mind,
doffing the cap my own son wears when gardening,
convinced that entropy does not apply
to my imagining

the dawn sun is a cosmic cow
who utterly consumes the rough cud of the world
to nourish nature in return
with no milk spilled

the trees do not lap up. No light is lost
when my command *let be*
restores the salt and pepper table still life
of invented memory

with you, Professor Pagels,
hoe and rake in hand, impatient there
for me to come help
weed the garden as the morning air

softly disperses
its gold hue on tilled soil patterned into rows.
And now, across the plotted fields,
actual cows,

miniature as ivories,
look up to see the flow of bordered green
contained for them. I shake the jar
again to get on with my life — the scene

changes to salt specks flying;
dandelion fuzz whirls with the windy day;
exploding or collapsing stars
recede forever through the Milky Way.

So come with me, Professor Pagels
to the garden, lightly come hoe with me,
together we'll compose
a laughing song, a dance of ordered entropy.

NEUTRINOS

In spite of their enormous numbers, [neutrinos] do not contribute much of anything to the total mass of the universe. But if they have mass then it is estimated that they would account for 90 percent of all the mass of the universe — an invisible mass, because no one can actually see this neutrino "background radiation." The other 10 percent — the minor part — is the visible matter in the form of stars and galaxies. Neutrinos could thus account for the "missing mass" of the universe — the amount required to halt the expansion of the universe and cause it, finally, to contract.

—Heinz Pagels,
The Cosmic Code

This fall I'm rooting for contraction!
Please, Professor Pagels, find the missing mass
that would assure mankind
expansion will reverse and bring to pass

the ultimate collapse,
some distant but inevitable day,
of matter on itself. I'd know
the universe would go its wished-for way

returning to the nothing
it originated from; big bang would detonate
space-time into existence
once again, and once again our fate

would be a universe of gas
expanding into stars and galaxies.
Such cycles breathing out
and breathing in — eternities

unto themselves — depend upon the gravity
of background radiation. Oh!
my happy, holiest of weighty hopes
is that invisible neutrinos

do possess the mass
to keep the universe from thinning out forever
to a lifeless void, a thin,
undifferentiated cosmic mist, never

to be born again, never to fashion
suns and moons, rivers, forests, mountains, trees,
a planet tilted on its axis
for all seasons' sake (at twenty-three degrees),

migrating robins, crocuses,
red tulips, daffodils,
then summer lilies, honeysuckle, columbine,
(how eagerly each sweet name trills

►

liltingly on the tongue to welcome them!)
and on to autumn when
the valley fills with aster, hyssop, goldenrod,
until first snow skips round again

and pale narcissus, sprouting inside by a window
in a blue, ceramic bowl,
unfold the bloom of their aroma in the dawn.
To love the universe, the whole

flowering pageant of emerging forms, always
has meant we've hoped for the return
of each leaf seasonless in paradise, and yet
I know that we must learn

recurrence can't bring back what's here: moonlight
bestowing stillness on my wife;
my sunlit daughter savoring a peach;
my own remaining life.

Professor Pagels, if your blank neutrino does
have any mass at all,
a tilted planet would fulfill my breath's best wish
for springtime, summer, winter, fall.

THE RED SHIFT

The discovery of the expansion of the universe [was made] by Edwin Hubble in 1929-1931. He observed that the red shift of the light from distant galaxies is proportional to their distance from us. His conclusion is based on the fact that an atom which is moving away from us at high velocity, such as in a distant galaxy, has its spectral lines shifted to the red in proportion to its velocity. —Heinz Pagels, *The Cosmic Code*

I'll bet, Professor Pagels,
Hubble made his great discovery
by first observing in
himself a red shift in the galaxy

of his own past, watching the boy
who he once was recede
knee-deep across the bending grass
at hazy dawn where wind-blown roses breed

in scrubby patches by the cliff.
He sees him carrying a bright red pail
to put collected sea-shells in
as he descends, holding the driftwood rail

his father made from ribs of boats,
down to the dunes that curve
along the bay and arc the eye
out to a spit of shore, then, with a swerve,

still further out, beyond
the current, churning water green to blue,
where a red buoy gongs its bell
and resonates. Oh, I can hear it, too,

Professor Pagels, look!
returning on the beach, that's me
precisely as I was,
poking a tentacled anemonae,

while swift bank swallows whir
and swoop into their nesting holes
in colonies along the sandy cliffs,
and gulls dive in the shoals

squawking for broken crabs crushed in the tide.
The past is *now* wherever light
arrives in shifts of red
from galaxies whose distant flight

must be proportional
to the velocity at which they move away.
I see the boy's red pail,
I hear the buoy bell — as if that day

came back . . . but not to be possessed.
It comes back as the loss
of what it was — absence made palpable —
with all the glinting dross

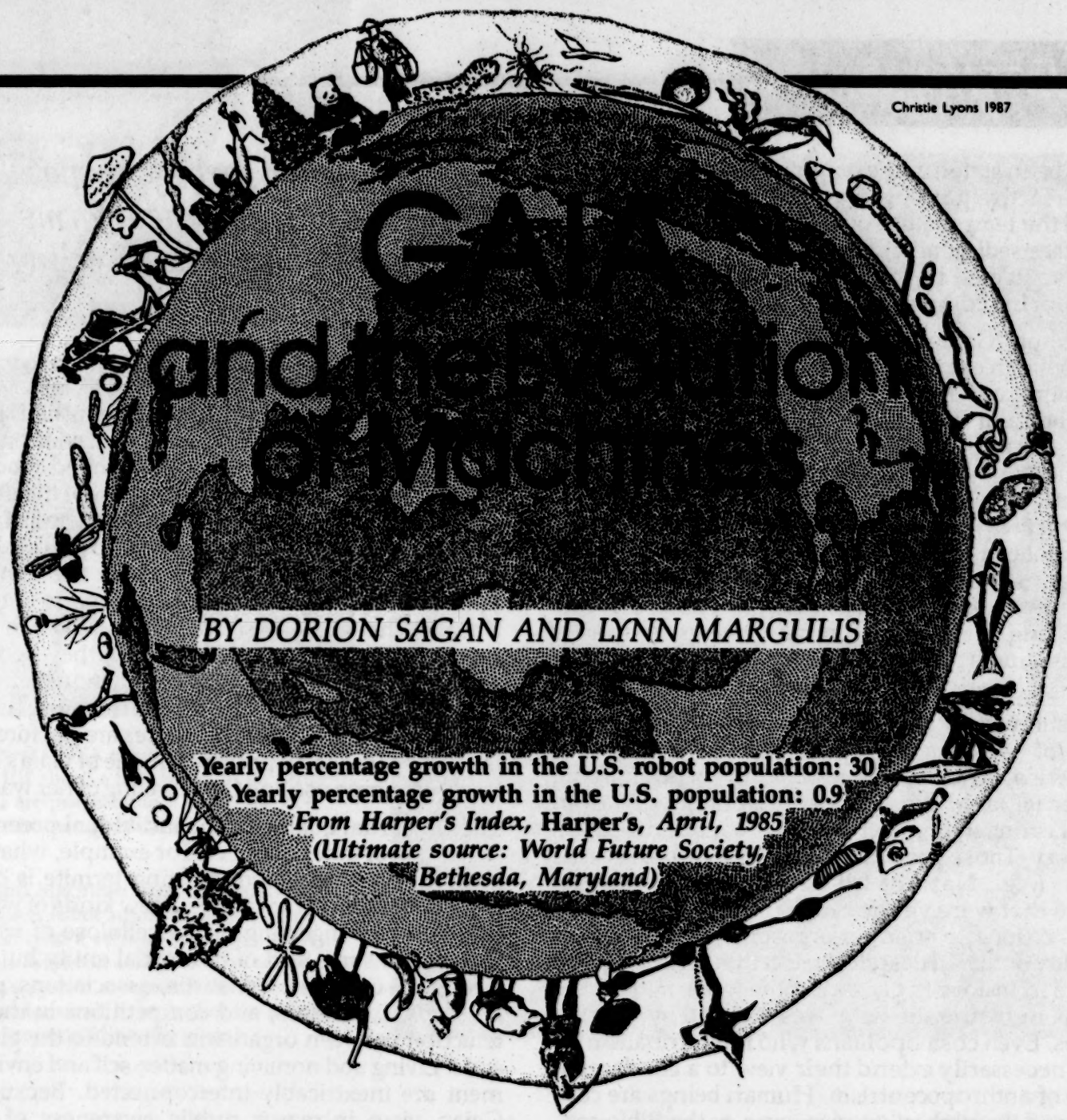
of scallop shells and mandibles and claws
filling the foaming rush
of slushing tide along the shore —
without the grainy touch,

the suck of feet upon wet sand.
And now, in my own shifting sight, I feel
increasing distance from
my recollecting self which seems unreal

to me — a me that's even
separated from the cliff here where I stand,
my present life. Moving away
from that boy with a red pail in his hand

who hears a buoy bell
that long ago has ceased to ring,
moving away from the observer that I am
this spectral dawn, singing

a cycling red song to myself
among the flowing, wind-blown grass, I see
my life arrive light years from now,
complete at someone else's galaxy.



BY DORION SAGAN AND LYNN MARGULIS

Yearly percentage growth in the U.S. robot population: 30
Yearly percentage growth in the U.S. population: 0.9
From Harper's Index*, Harper's, *April, 1985
(Ultimate source: World Future Society, Bethesda, Maryland)

THE GAIA HYPOTHESIS was invented by James Lovelock over twenty years ago to explain the tendency of the Earth's lower atmosphere to maintain for millions of years its temperature, oxygen concentration and alkalinity within rather narrow limits. The self-maintaining properties of cells, organisms, communities and ecosystems can be extrapolated to the atmosphere and surface sediments of the planet Earth. Not only are members of the more than 10 million existing species components of the Gaian regulatory system but so are our machines. Here we argue that although not by themselves alive, like viruses and beehives, machines are capable of reproduction, mutation and evolution. That is, even though they are not autopoietic, machines do evolve.

Knowledge of the Gaia hypothesis and its implications is catching on. For example, in an attempt to unite scientific research at all levels toward an understanding of our living planet, the Global Environmental Research Organization (GERO) has been launched.

The planetary world view has been inspired in part by Lovelock's popular book *Gaia: A New Look at Life on Earth*[1]. An independent atmospheric chemist and biological theorist, Lovelock has been aided by chemical oceanographer M. Whitfield of the Marine Biological Association. Both recognize that the chemical elemental distribution in the ocean is driven by living processes. Together with the undersea explorers and satellite imagers, scientists are beginning to work together to formulate a description of the biota now and in the past. Dr. J. F. Stolz of the California Institute of Technology and Dr. Y. Cohen of the Eilat Marine Station, Israel, have both revealed the microbial underlayer: what seems like gritty sediment, on inspection by electron microscopy, resembles the neatly layered tissues of animals or plants. The Gaia hypothesis

1. J. E. Lovelock, 1979; $6.95 postpaid from Oxford University Press, 16-00 Pollitt Drive, Fairlawn, NJ 07410.

Lynn Margulis spoke to the Reality Club on "The Origins of Sex" at Rockefeller University on March 3, 1982. Lynn is a molecular biologist, Professor of Biology at Boston University, author of Symbiosis in Cell Evolution *(W. H. Freeman, 1981) and co-author, with Dorion Sagan, of* Microcosmos *(Summit Books, 1986). Dorion, Lynn's son, is the author of* Biospheres *(forthcoming from McGraw-Hill).*
—John Brockman

has been stated and extended: the composition of the reactive gases, the oxidation state, the acidity and the temperature of the lower atmosphere and surface sediments of the planet Earth are dynamically regulated by the activities of differentially reproducing communities of interrelated organisms.

A whole Gaian style of thought is emerging in which perception is seen as a participatory phenomenon, and with which we become more aware of the sum of organisms within the biosphere. Those who are becoming aware of the many possibilities of better lives are banding together into teams to write books (Myers, 1984[2]), publish magazines (Gerard Blanc: *Coevolution*,[3] Paris) and compose music (Paul Winter: "Missa Gaia"[4]). The Gaia Institute at the Cathedral of St. John the Divine in New York City sponsors cultural events stressing the unity of human beings and other organisms in the biosphere.

Nonetheless, entrenched Judeo-Christian beliefs are still widely held by the diverse energetic people of western Europe and northern North America. The monotheistic concept identifying paternal family control with nationhood was an inculcating meme that began with modern written history. Those partaking of this meme or its variations (e.g., Nazism) felt no responsibility for actions that were vindicated by a father-like power. This corporate or super-orgasmic lack of accountability occurred despite the fact that at certain junctures in history (e.g., during the Reformation) the same monotheistic deity was invoked by warring sides. Even cosmopolitans who reject tribalism do not necessarily extend their view to a condemnation of anthropocentrism. Human beings are considered the highest species, even as the Bible considers Jews the chosen people. But traditional human ideas are in contrast with Gaian perceptions that link people inextricably, and in subordinate fashion, to the biota, that is, to the sum of plant, animal, and microbial life. On the other hand, the Gaian thought style is not unique but partially a return to an older way of seeing and relating to nature.

Like any parts of life, the old and "new" thought styles are not dichotomous but arise from the same organically interconnected biosphere. Yet prevailing thought styles have the advantage of momentum. All the weight of Western history and success attach to political groups that subscribe to the idea of man's domination of nature. The Gaian thought style, however, extends "horizontally" to other organisms and "vertically" beyond human history. In it, human beings and technology may be seen as environments in the biosphere. The biosphere is supported by uncounted trillions of organisms simultaneously indulging in great growth rates and

A kitchen-sink garbage disposal is but one of Gaia's new forms of energy use and the recycling of her wastes.

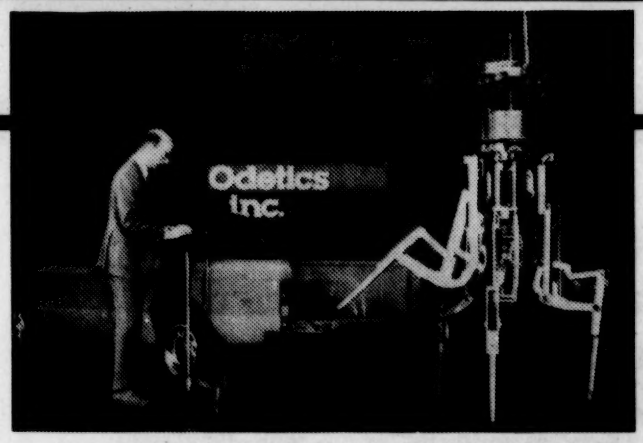
equally immense death rates, photosynthetic food production, and the intricacies of food sharing. For example, what people reject as "spoiled food" is healthy growth from the point of view of the dense hyphae of zygomycotous and ascomycotous fungi colonizing our bread. Though waste to us, the dung of cattle is both food and shelter to the dancing *Pilobolus* fungus and the dung beetle larvae. Uneaten cheesy crusts stuffed down a kitchen sink garbage disposal are not "wasted"; they become the source of life for vast populations of omnibacteria, ciliates, mastigotes, germinating fungal spores, and so on. These processes are not foreign. Indeed a garbage disposal is but one of Gaia's new forms of energy use and the recycling of her wastes.

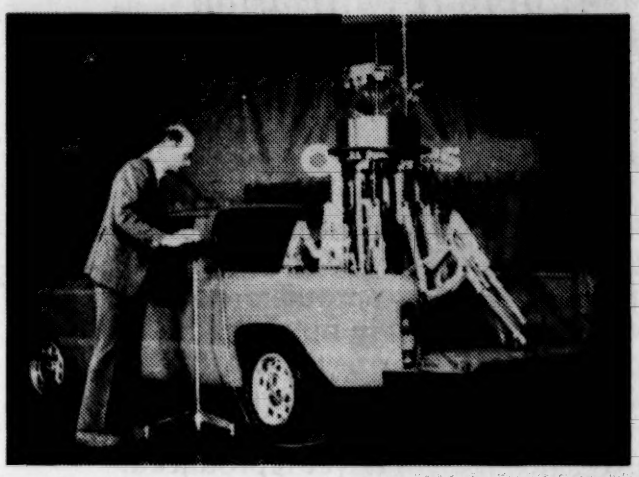
The consortial quality of the individual preempts the notion of independence. For example, what appears to be a single wood-eating termite is comprised of billions of microbes, a few kinds of which do the actual digesting of the cellulose of wood. Gaia is the same sort of consortial entity but she is far more complex. Consortia, associations, partnerships, symbioses, and competitions in the interaction between organisms extend to the global scale. Living and nonliving matter, self and environment are inextricably interconnected. Because a Gaian view increases public awareness of our dependence upon other life forms, it is extremely valuable in battling the prevailing ideologies of selfishness: that nature is either pristine and should be preserved or is simply a bunch of resources to be plundered. The truth is that we are deeply connected to all other organisms, cannot help altering them, yet must be conscious of and responsible for our actions.

Responses of the press and the reading public to many Gaian processes have been arbitrary and oriented toward crisis. The distorted biases of "hot topics" have included carbon dioxide, water pollution, acid rain, and the ozone scare. By waiting to respond until the crisis is upon us, we run the risk of social schismogenesis, violently positive feedback processes leading to cultural disintegration. Money is thrown at these problems in isolated attempts to buy easy solutions. Gaia has not been seen as an entity worthy of scientific study and research on biospheric self-regulatory mechanisms has never been directly funded. Not fitting neatly into any single academic field or budget category such as atmospheric science, biology, environmental chemistry, geology or wildlife management, research into planetary biology is nonetheless a vital topic impinging on all of Earth's inhabitants.

Most scientists, apparently, are still unaware of the

2. *Gaia: An Atlas of Plant Management*, Norman Myers, 1984. $17.95 postpaid from Anchor Press, Doubleday and Co., Inc./Direct Mail Order, 501 Franklin Avenue, Garden City, NJ 11530.
3. $22/year from *CoEvolution*, BP 43-75661, Paris Cedex 14, France.
4. 2-record album; $20 postpaid from Windham Hill Productions, P. O. Box 9388, Stanford, CA 94305.





(Above) ODEX robot can walk, climb, and lift about a ton. Some of its functions are programmed; some still require human guidance.

(Right) Machines making machines: a KUKA robot automatically mounts a wheel onto a vehicle being transferred by an overhead conveyor. The robot's vision system recognizes the orientation of the hub bolt hole so that the robot can properly align the wheel.

Gaian point of view. Some of those who have read the literature have criticized it. W. F. Doolittle, for example, finding no scientific basis for a "Gaian mechanism," denies the existence of the Gaian regulatory phenomenon. R. Dawkins denies Gaia on the basis of lack of competition for survival of the Earth relative to the flanking planets of Mars and Venus; also finding no mechanism, he preemptorily denies a regulatory phenomenon. A third critic, A. D. Holland, finds the Gaia hypothesis rather "charming" but "unnecessary." He invokes a variation of the anthropic principle; namely, that had the biosphere not evolved for billions of years we would not be around to marvel at its putative regulation mechanism. Advocating the position that only physico-chemical processes can regulate the acidity, temperature, and chemical composition of reactive gases of the lower atmosphere, the geochemist Holland denies biological environmental homeostasis.

Against such a backdrop, it is difficult for students of nature to investigate the physiology of the biosphere or their own position within what amounts to a living organism. At this point the reader may wonder whether we are advocating belief in an unproven assertion: Gaia, the modulated biosphere. We are, but only so far as it is necessary to replace outmoded thought styles. Since perception is impossible without assumptions (i.e., belief), and since all science is the result of perception, the objection that such a view is unscientific is vain.

Human beings are peculiar parts of the biosphere, which is a combination of life and its surroundings. The biosphere is part of us, and we have arisen from within it. As "technobes" — technologically dependent biological organisms — we have as much independence from the biota as a cancer virus has from the dividing cell in which it dwells. Those twin delusions of human grandeur — our natural superiority and scientific objectivity — are problems of projecting the techniques of human survival into realms where they do not belong. The trial-and-error method of science (forming and testing hypotheses) and the rapid transmission of science through culture are so similar to natural selection through mutation, on the one hand, and adaptation via bacterial genetic transfer, on the other, that science can be considered as unconsciously imitative and well within the scope of older biotic process. Reproduction occurs not only from organism to organism but hierarchically: molecules, cells, organisms, even communities — such as those comprising billions of microbes in the termite hindgut — reproduce. Science and art then are not simply human: both take after nature. ►

EVOLUTION OF MACHINES

Man invented the machine
and now the machine has invented man.

God the Father is a dynamo
and God the Son is a talking radio
and God the Holy Ghost is the gas
that keeps it all going.

And men have perforce to be little dynamos
and little talking radios
and the human spirit is so much gas
to keep it all going.

Man invented the machine
so now the machine has invented man.
D. H. Lawrence

Despite our machineless past, our autopoiesis now depends on machine organization in much the same way that cells of our body depend on human organization (anatomy and physiology).

LET US INDULGE the human mind's penchant for categorical choices and forecast the future of humanity. Either there will be a catastrophic nuclear war that destroys our technologies, or our technologies will control themselves and machines will begin reproducing in outer space. If the former occurs, people will vanish from the biosphere, global ecology will shift, and the biosphere will evolve in curious directions. It will not be a victory for humanity. However, if we survive our nuclear threat and become a multiplanet civilization, reproducing in outer space, this too will not necessarily be a victory for humanity. It will be a victory for the biosphere, for the nexus of all life, inclusive of machines.

The great ape *Homo* in his present state is a singularly technological creature. In truth, a human being may be thought of as an obligate technobe, a weak body entirely dependent on rapid harvesting of agricultural grasses, on milking, slaughtering, and packaging domesticated artiodactyls; on extraction of organic compounds, remnants of vast communities of photosynthesizers as fossil fuel oil from deep wells; on electromagnetic communication satellites, on automobiles, and airplanes; in short, on machines.

If there is a central insight to evolution it is that patterns of living organization are transitory. A similar insight exists in the great Eastern religions. The doctrine of reincarnation teaches that there is a never-ending cycle of life and rebirth. Buddhism teaches that Nirvana is the blissful release from such a cycle. Human beings present no exception to the law of change. The acceleration of technology since the horse-and-buggy days predating World War I to the development of a global technology after World War II attests less to the glory of God than to the amoral demiurge that is the evolving biosphere. *Australopithecus robustus, Homo erectus, Homo sapiens,* food gathering bands, hunting troops, and village life are all fleeting apparitions on the great stage of evolution. So are Tokyo and New York. Agricultural apes and cities represent stages in the development of the biosphere, which is becoming depleted in life and suffused with technology.

Unfortunately, for those who believe humanity is the apotheosis of life on Earth, the idea of reproducing von Neumann machines [computers —ed.] is not a matter of scientific fantasy but a matter of fact in the present organization of the biosphere. If we consider Gaia or the biosphere as life's most fundamental unit, then even the Earth cannot be considered alive since it has not yet reproduced. Indeed, only the organic macromolecules DNA and RNA are capable of reproduction in the replicative sense: in one act of synthesis, they make complementary copies of themselves. All else — cells, boys, elephants, trees, McDonald's, and branches of the Chase Manhattan Bank — do not directly reproduce. Much molecular replication, cell growth, development and construction is involved before two cells, two boys, two elephants, two trees, two McDonald's and two bank branches appear in the biosphere where a single one was before.

Unfortunately, nature is not dichotomous in a way that matches our verbalizations. Nature does not conform to our definitions. Although there is an ineffable continuum between the living and the nonliving, we are beginning to understand the functions and organizations that are common to living entities. Living systems, from their smallest limits as bacterial cells to their largest extent as Gaia, are *autopoietic:* they self-maintain. As autopoietic systems they are bounded — they retain their recognizable features even while undergoing a dynamic interchange of parts. The *only autopoietic* systems we know of on Earth are composed of carbon, nitrogen, and hydrogen compounds in water and are bounded by lipid membrane. But organization and function — not composition — distinguish autopoiesis. A recent corpse and a man have nearly identical composition but they differ profoundly in organization and function. The self-assembly, self-maintaining autopoietic system distinguishes the living man.

Autopoiesis is a prerequisite to reproduction: if life is defined as a system that reproduces and mutates, then a barren woman is not alive. Of course, fertile or sterile, a woman is an autopoietic system. But autopoietic systems are interdependent and connected. Because of these connections an autopoietic system smaller than Gaia may not exist. Components of autopoietic systems reproduce. The reproduction of autopoietic systems depends on the autopoiesis of the components of such systems.

Courtesy Raymond Colladay, National Aeronautics and Space Administration

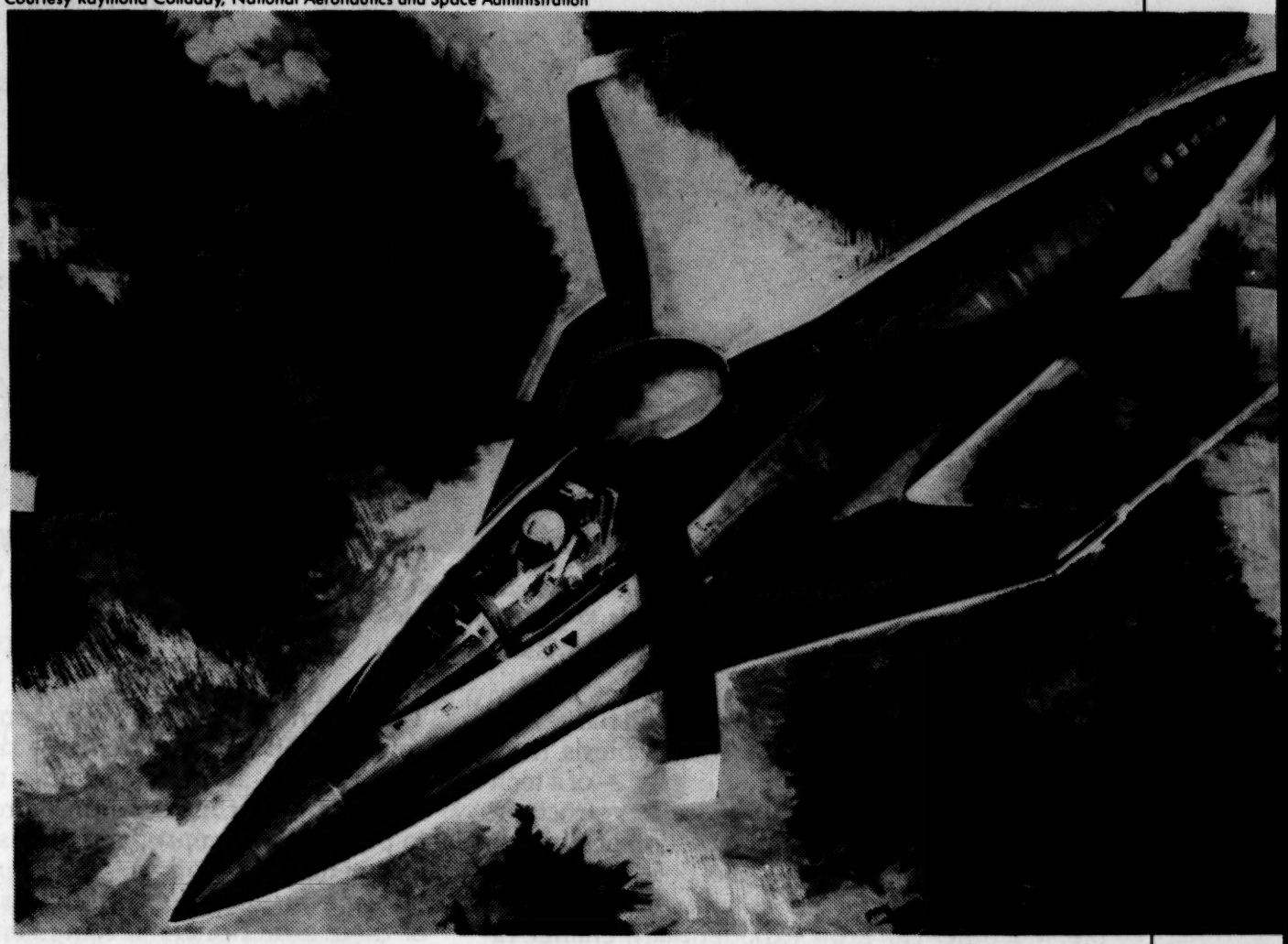


Figure 1: **Advanced Rotocraft. This planned recombination of an airplane and helicopter, imagined here by a NASA artist, testifies to the organic nature of reproducing machines. As an extension of human life, our combined evolution with them proceeds in a mutually dependent way.**

Machines reproduce. Alone, they do not self-assemble. They do not self-maintain: machines alone are insufficient *parts* of autopoietic systems. Despite our machineless past, however, our autopoiesis now depends on machine organization in much the same way that cells of our body depend on human organization (anatomy and physiology).

Biological precedents for machine reproduction abound. For instance, when proteins are produced on mitochondrial ribosomes, protein synthesis is part of the autopoiesis of the cell. When cells reproduce, their reproduction is part of the autopoiesis of the animal. When animals reproduce, their reproduction is part of the autopoiesis of a technological society. The reproduction of technological societies and their components is part of the autopoiesis of the biosphere. Indeed if technological societies as part of a phenomenon of global life reproduce, the machines within them, as well as the people, also reproduce. Only DNA and RNA can replicate, but we are surrounded by machines.

Samuel Butler, whom Gregory Bateson called "Darwin's ablest critic," expressed some compelling ideas on the evolution of machines. Because they were written under the pen name "Cellarius," we believe Butler's original intentions were clearly ironic; however, his comments strike us as timely. "There is nothing which our infatuated race would desire more than to see a fertile union between two steam engines." Butler explains that the mechanical engines are more efficient at converting raw materials into energy for work and that they generally require less maintenance than draft animals. Today, of course, the prowess of machines and their interdependence with human beings is far greater than it was in Butler's time (**Fig.1**). From a biospheric view, machines are one of DNA's latest strategies for autopoiesis and expansion. The classification of machines as non-autopoietic and nonliving does not negate the fact that they reproduce, and reproduce with mutation, as avidly as viruses. Like beehives, termite mounds, coral reefs, and other products of the activity of life, machines — if indirectly through DNA and RNA — make more of themselves. Through us they make other machines.

The Viking Lander on the surface of Mars does not maintain its own structure or actively preserve its boundaries. Alone, lacking communication, it is no longer autopoietic. But from 1975 to 1982, when all of its communication with the Earth was halted, even the Viking Lander was part of an autopoietic system. Machines, by themselves on Mars, are not autopoietic. Machines tended by their workers form part of the autopoietic systems of their makers.

Agricultural contrivances such as tractors and harvesters provide food that encourages a weedy growth of human beings. Among these human beings are agricultural engineers who design, devel-

Figure 2. Now a "fossil" on Mars, the Viking Lander shut down when its Earthian funding was cut. Viking got to Mars before humans did because it was better able to withstand space conditions.

op, construct, and sell more tractors and harvesters. From the vantage point of global autopoiesis, these machines are organelles — little organs — of a technological society just as hives are the structures insuring autopoiesis and reproduction of social insects. Somewhat alarming, the potential growth of machines far exceeds that of the bodies of people. Machines can grow exponentially, change rapidly, and reproduce the changed form more quickly than *Homo sapiens* can.

We are fond of labeling recent, large, adaptive, expanding populations of mammals as "evolutionarily advanced." We tend to think of rapid change and aggressive patterns of reproduction, recent evolutionary appearance and large size as advancement. Yet we could claim, even by these same criteria, that machines are even more evolutionarily advanced than the large mammals. They change form at a far more rapid rate than any animals: witness the automobile, the telephone, the photocopier, and the personal computer. Machines, as a group, are able to survive more extreme environments than are people and other mammals. Mammals, for example, unless they have evolved for millions of years in watery environments, cannot survive under water without submarines. Submarines, on the other hand, manage very well beneath the sea, managed by remote control machines at the surface. Machines have penetrated space and remained there far longer than people have. The two Viking Landers, launched in 1975 and now stripped of their autopoiesis, still decorate the stark surface of Mars (**Fig. 2**). In many localities the rate of machine growth, taken together, far exceeds the rate of human growth. In general, generation time for machines is far shorter than that for people. Machines outperform people in information functions such as arithmetic and printing. Machines have a greater range of mechanical energy at their disposal, such as nuclear fusion, combustion, and photoelectric power.

That machines apparently depend on us for their construction and maintenance does not seem to be a serious argument against their capacity to evolve. In the future we may program machines to program and reproduce themselves even more independently from us — at present machines evolve — using autopoietic us as an integral part of their evolutionary mechanism.

Another serious argument against machinate evolution is that they contain no DNA or RNA and tend not to be made of carbon-nitrogen compounds in water. But beehives, snail shells, and insect exoskeletons lack DNA and RNA as well. Machines — like beehives and exoskeletons — evolve retaining their connections to our autopoietic selves. Autopoiesis and evolution are not determined by composition, but by function and composition. The debate over what is and what isn't capable of evolution takes on new fascination as a close study of waste transformations and an atmosphere steeped in biogenic (including anthropogenic) chemicals reveals that no clear line can be drawn between organisms and their environment. If life is defined as autopoietic reproducing entities based on reduced carbon compounds, then at first glance machines can never be alive since they are not based on carbon. Yet what is meant by "based"? Surely any invention of human beings is ultimately based on a variety of processes including that of DNA replication, no matter the separation in space or time of that replication from that invention.

Civilization as we know it can no longer survive without machines. It seems likely that humans will survive to govern the transition from an organic to a technobic biosphere. Just as termites making mounds from their feces outgrew their ancestral wood-eating roaches that did not fashion homes from excrement, apparently human beings in association with machines have a great selective advantage over those alienated from machines. Material processing of the external environment mat-

NASA

Nearly an entire hemisphere of Ganymede is seen in this Voyager 2 image.

NASA

Evidence of the selective advantage of people with machines follows from observations of the rates at which "underdeveloped" countries are trying to catch up with "developed" nations.

Figure 3. Before its electronic link to Earth was severed, Viking served as a machine-extension of our biosphere — it was still connected to Earth's biota. This is a Viking photograph of a Marsscape.

ters in evolution. New elements and chemical compounds are brought into the processes of life. Evidence of the selective advantage of people with machines follows from observations of the rates at which "underdeveloped" countries are trying to catch up with "developed" nations. One imagines an even greater selection advantage to those humans who totally reuse their waste, both cultural excretion such as pollution and organic wastes such as sewage.

We may compare the future evolution of machines to the evolution of life on dry land 400 million years ago. Life may continue to expand by technobic autopoiesis. It may, in staggeringly short time periods, penetrate vast regions of the galaxy. Indeed, compared to former evolutionary advances onto dry land and into the atmosphere, taking hundreds of thousands of years, galactic habitation may occur nearly instantaneously and take one hundred years. This surmise is derived from the general phenomenon of evolutionary acceleration.

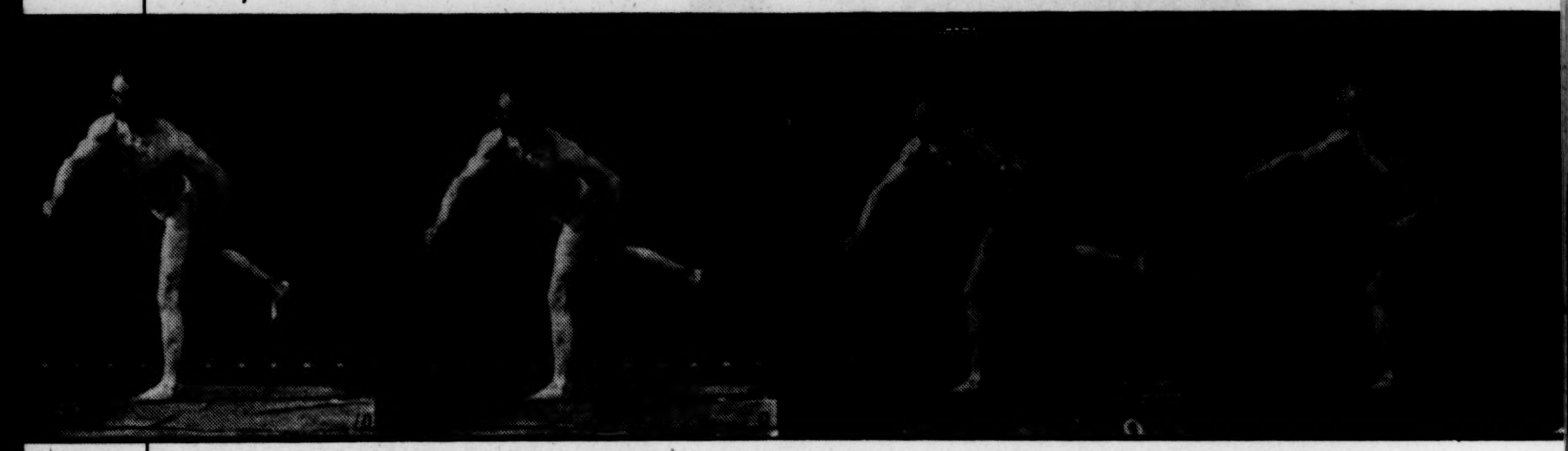
From a long-term biospheric point of view, we may be less important than our machines. "Fossils" of machines, as we have seen, already exist in the solar system beyond the Earth. From 1976 until the shortage of NASA funding caused their connection with the autopoietic Earth to be severed in the early 1980s, the Viking orbiters and landers periodically surveyed the lonely stillness of the Martian landscape (**Fig. 3**). Other machine-extensions of the biosphere, in the form of Soviet and U.S. spacecraft, orbiting various celestial bodies, primarily the Earth, are still very much connected to the biota. They are part of the system and in fact are far less vulnerable to external threats than are we as flesh-and-blood beings.

Neutron bombs, capable of destroying our human bodies, are expected to leave the more durable machines system intact. The future of our machines, provided they can remain part of the autopoietic biosphere, is less bleak than that of ourselves.

The Gaian biosphere with its multitudes and bizarre histories will, we reckon, persist at least until the death of the Sun. Our ancestors were apes, and if we saw them today, we would probably wonder if they had escaped from some local zoo. Our descendants may find themselves in a similar predicament with machines, who will also be our descendants. This being the case, we can only hope that Butler's 1863 satiric comment:

> *We treat our horses, dogs, cattle and sheep, on the whole with great kindness, we give them whatever experience teaches us to be best for them, and there can be no doubt that our use of meat has added to the happiness of the lower animals far more than it has detracted from it; in like manner it is reasonable to suppose that the machine will treat us kindly, for their existence is as dependent upon ours as ours is upon the lower animals.*

will not prove to be a simple statement of our technological future. ■



BOOTSTRAPPING THOUGHT
Is Consciousness a Darwinian Sidestep?

BY WILLIAM H. CALVIN

NCE UPON A TIME, probably when a group was gathered around a campfire back in the ice ages, someone first remarked that humans were just a particularly capable kind of animal. This undoubtedly led to the first argument about the most fundamental difference that boosted humans up from the apes.

Motherhood is hardly unique, but what about monogamy, with all its advantages for raising children? Then some spoilsport observed that even some birds are monogamous (indeed, about 93 percent of bird species, compared to 5 percent of mammals).

"Man the Hunter?" Predation is, alas, quite common, and it's not until one considers predation via projectiles — such as throwing stones and spears — that aspects of hunting get to be uniquely human.

"Man the Tool-using Animal?" But those bird-watchers spoiled the story again, observing that some birds use sticks to probe holes, hoping that some insects will unwisely climb aboard. Chimps fish for insects too, and they even crack open nuts using rock hammers in an amazingly human-like manner (those who infer a particular gender from any use of the word "man" should note that it's the female chimps who are clearly the experts in both termite-fishing and nut-cracking).

So perhaps it's "Man the Tool-making Animal?" Ben Franklin coined that one 200 years ago, but we now know that chimps violate his dictum when they prepare to go fishing for tasty termites, selecting just the right supple stick and then breaking off all the leaves and side branches so it will fit down the many-branched tunnel in the termite mound.

"Man the talking monkey?" Actually, monkeys and apes have a lot of social communication even without vocalizations — they use body postures and facial expressions to send messages. Eye contact can be quite threatening (if you ever meet a gorilla unexpectedly, look at your feet — it's not polite to stare!). They supplement body language with dozens of different kinds of vocalizations, each having a standard interpretation — they don't usually embed special meaning in the sequences of different sounds the way that we do, but "dumb animals" they're not, in either sense of the adjective. What's unusual about human language is not resonant vocalizations but arrangement rules: we've used se-

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William Calvin discussed "Throwing and Brain Evolution" at a Reality Club meeting in my living room on December 11, 1985. Bill is Professor of Neurobiology, University of Washington, author of The Throwing Madonna: Essays on the Brain *(McGraw-Hill, 1983) and* The River That Flows Uphill *(Macmillan, 1986). —John Brockman*

All photographs from *The Human Figure In Motion* by Edweard Muybridge (Dover, 1955).

quential ordering to make language unusually productive — we can utter novel, never-heard-before sound sequences (this sentence, for example) and still have someone understand us. Other species rarely send, much less successfully receive, novel messages.

Now, you can play this human-uniqueness game for a long time, as there is an encyclopedic list of traits which we in fact don't share with the other animals. Consider concealed ovulation — no more "heat" behaviors advertising the time of fertility halfway between menstruations, leading to our peculiarly nonstop sexual activity. Few other species waste a lot of time and energy copulating when the oviducts are empty and conception impossible, e.g., chimps seldom mate while still breast-feeding, which goes on for years. Hiding ovulation, forcing both parties to spread their bets, may be very important for setting up our version of monogamy, and thus making possible the long childhood and other human developmental characteristics.

Yet that's not "mental" enough, someone will say — many changes were essential, but the name of the game is to find the most fundamental innovation that leads to the higher humanity, to things like our versatile language, our morality and ethics, our consciousness and free will.

Well, you know how these things go. The physicists will have some candidate that involves quantum mechanical tickling of the synapses, the hunters will nominate hunting, the politicians will like the possibility that leadership is what our progress was all about, and the preachers will nominate cooperation and goodwill as emergent properties that turned the tide of bestiality. And so it's not too surprising to find writers, and teachers of writing, proposing storytelling as a central aspect of our humanity.

The first sign that a baby is going to be a human being and not a noisy pet comes when he begins naming the world and demanding the stories that connect its parts. Once he knows the first of these he will instruct his teddy bear, enforce his world view on victims in the sandlot, tell himself stories of what he is doing as he plays and forecast stories of what he will do when he grows up. He will keep track of the actions of others and relate deviations to the person in charge. He will want a story at bedtime. Nothing passes but the mind grabs it and looks for a way to fit it into a story, or into a variety of possible scripts . . .
—Kathryn Morton,
"The Story-Telling Animal," 1984

Our lives are ceaselessly intertwined with narrative, with the stories that we tell and hear told, those we dream or imagine or would like to tell, all of which are reworked in that story of our own lives that we narrate to ourselves in an episodic, sometimes semiconscious, but virtually uninterrupted monologue. We live immersed in narrative, recounting and reassessing the meaning of our past actions, anticipating the outcome of our future projects, situating ourselves at the intersection of several stories not yet completed.
—Peter Brooks,
Reading for the Plot, *1985*

Story-telling? But wait — other seminal thinkers have been proposing it too, suggesting that the brain's scenario-constructing abilities are absolutely central to many of our other, and most valued, peculiarly human traits. Is there something truly special about storytelling, or (as I will suggest) about the underlying brain machinery for handling a long string of items?

The most important problem which our conscious knowledge should enable us to solve is the anticipation of future events, so that we may arrange our present affairs in accordance with such anticipation.
—Heinrich Hertz,
19th-century physicist

To classify consciousness as the action of organic machinery is in no way to underestimate its power. In Sir Charles Sherrington's splendid metaphor, the brain is an "enchanted loom where millions of flashing shuttles weave a dissolving pattern." Since the mind recreates reality from the abstractions of sense impressions, it can equally well simulate reality by recall and fantasy. The brain invents stories and runs imagined and remembered events back and forth through time.
—Edward O. Wilson,
On Human Nature, *1978*

[Man's] unique ability to imagine, to make plans . . . are generally included in the catchall phrase "free will." What we really mean by free will, of course, is the visualizing of alternatives and making a choice between them. In my view, which not everyone shares, the central problem of human consciousness

depends on this ability to imagine.
—Jacob Bronowski, The Origins of Knowledge and Imagination, *1967*

A central aspect of consciousness is the ability to look ahead, the capability we call "foresight." It is the ability to plan, and in social terms to outline a scenario of what is likely going to happen, or what might happen, in social interactions that have not yet taken place.... It is a system whereby we improve our chances of doing those things that will represent our own best interests. . . . I suggest that "free will" is our apparent ability to choose and act upon whichever of those [scenarios] seem most useful or appropriate, and our insistence upon the idea that such choices are our own.
—Richard D. Alexander,
Darwinism and Human Affairs, *1979*

Storytelling is deeply embedded in humanity. Consider those long winter evenings huddled around an ice-age campfire when the storyteller held forth, both entertaining and conveying a sense of distant times and places.

Loren Eiseley observed, "Animals are molded by natural forces they do not comprehend. To their minds there is no past and no future. There is only the everlasting present of a single generation, its trails in the forest, its hidden pathways in the air and in the sea." An awareness of unseen peoples, places, events, and inventions can be conveyed by language. On the surface of it, language is what's special, and storytelling is just one of its applications — though a particularly effective one in the long run.

Hanging events and inventions onto the framework of a story — perhaps involving an epic journey visiting many places — is not only a mnemonic device to keep the individual items from getting lost, but a serial adventure which seems to hold the attention of the listener particularly well. Producers of soap operas know this, but not modern textbook authors. Writers are forever rediscovering this advantage: Robert Pirsig hung classical philosophy onto the framework of a journey in *Zen and the Art of Motorcycle Maintenance;* more recently, I hung many aspects of evolution onto a river diary of a two-week float trip through the bottom of the Grand Canyon (*The River That Flows Uphill: A Journey from the Big Bang to the Big Brain*).

The peculiar efficiency of the storyteller's art may also have something to tell us about our mental life, and what presumably makes it so different from that of the other animals. Each of us tends to make up stories — even when we sleep. We try to explain the past, trying out various scenarios. We extend them into the future by guessing the diverse events that might occur, seeing how the story sounds with thus-and-such a completion. We make choices when comparing these scenarios for the future, and in such choice lies a crucial aspect of our humanity. Storytelling is not just a good story itself, but illustrates something more fundamental — something in our brains.

Since we have had little notion of how the brain works until recently, it is not surprising that explanations have all been of the hand-waving variety, e.g., the notion that an immaterial soul controls a subservient brain, analogous to a driver (made of soft stuff) controlling a truck (made of hard stuff). Such passing-the-buck explanations merely put off the question without enlightening anyone. Passing the buck not only occurs with postulating that the most interesting properties of our brains are outside the brain, but makes a bizarre appearance when investigating the origins of life itself. Postulating that the Earth was seeded with life (or at least DNA) only moves the interesting question to another location, inaccessible to inquiry. Like the soul, panspermia may exist but it tends to become a repository for the window-dressing that we use to hide embarrassing ignorance. Yet such "passing-the-buck explanations" illustrate the dilemma: we explain things mostly in terms of analogies to devices and systems which we understand better, and the 17th-century technology of Descartes' time didn't have much to offer in approximations to intelligent behavior.

When the telephone switchboard was the fanciest communications system around, the brain's functions were held to be analogous to the operator routing calls from the eyes to the appropriate muscles. When the computer came along, it became a better metaphor for both memory and simple decision-making processes. Now we know that the brain works very differently than modern computers, both in the way it stores information (computers use pigeonhole-type storage, the brain doesn't) and analyzes its input. The only trouble is that we're outrunning our

supply of metaphors, groping around using inadequate analogies.

Happily, neuropsychology and neurophysiology are producing a new foundation less dependent on metaphor. In the left brain vs. right brain saga, it now turns out that the supposed specialization of the left brain for language is probably just a secondary effect of a more primitive specialization of the left hemisphere for handling sequences. Even monkeys seem to process rapid sound sequences preferentially in their left brains. In humans, one can see that a sequence of movements (such as inserting a key in a lock, turning it, turning and pushing on the doorknob) is all programmed out of the left hemisphere, whether carried out by left hand or right hand. Patients with language difficulties after a stroke often have difficulties with such sequences, even though they can perform each action separately.

From neurophysiology comes the surprising finding that the core of the human language cortex is specialized for handling both sequences of sound and sequences of facial expressions. The same regions of cortex that hold onto the sentence you hear, while analyzing it for phoneme transitions and the subject-verb-object codes that convey its meaning, also seem to be used to produce the rapid sequence of face-mouth-larynx muscle contractions that you use to utter another sentence. The specialization at the core of language cortex seems to be sequence, not input alone or output alone. It's like a railroad marshaling yard, not a train station or main line.

Rehearsing movements may be the key to appreciating the brain mechanisms, if I may quote from my diary:

> "We have an ability to run through a motion with our muscles detached from the circuit, then run through it again for real, the muscles actually carrying out the commands. We can let our simulation run through the past and future, trying different scenarios and judging which is most advantageous — it allows us to respond in advance to probable future environments, to imagine an accidental rockfall loosened by a climber above us and to therefore stay out of his fall line."

Neural circuits that plan out the sequence of rapid-fire muscle contractions that one uses to launch a spear may be something like a marshaling yard assembling strings of railroad cars. Think of the fireworks finale, all those combined sequences of skyrockets launched from a half-dozen launching platforms, and you'll have some notion of the volleys that the brain must orchestrate, going out to dozens of muscles in the arm and hand as you throw.

And such sequencers may be useful for all sorts of peculiarly human sequences. Such as planning these sentences. Such as the more leisurely sequence that we use to plan and prepare a four-course dinner. Or tell a story, or create the chains of ideas we call "logic." The storyteller's insight about what is most interesting to other people may reflect some very basic neural machinery in our brains.

Which came first among all the useful sequence-dependent human abilities? I doubt that it was foresight, simply because it seems so rare in the animal kingdom despite its striking usefulness. Jacob Bronowski put it very well in his 1967 Silliman Lecture at Yale: "[None of the termite-fishing chimps] spends the evening going round and tearing off a nice tidy supply of a dozen probes for tomorrow. Foresight is so obviously of great evolutionary advantage that one would say, 'Why haven't all animals used it and come up with it?' But the fact is that obviously it is a very strange accident. And I guess as human beings we must all pray that it will not strike any other species."

My candidate for a primary sequence-dependent specialization is, instead, rapid movements such as hammering and throwing: they require elaborate planning, as feedback won't work. When I make typical arm and hand movements, as when I reach for the coffee cup and bring it to my lips, I make lots of feedback corrections during the several seconds it takes to perform the action. But feedback requires that sensory nerve impulses (concerning, for example, the actual position of my hand once I add to it the weight of the loaded coffee cup) travel up the arm, into the spinal cord, up to the brain, back down again and out to the muscles — and it all takes time, often 1/5 of a second for a round trip. My corrections are always a little out of date because of this reaction time.

For movements that, from start to finish, take little more than 1/5 of a

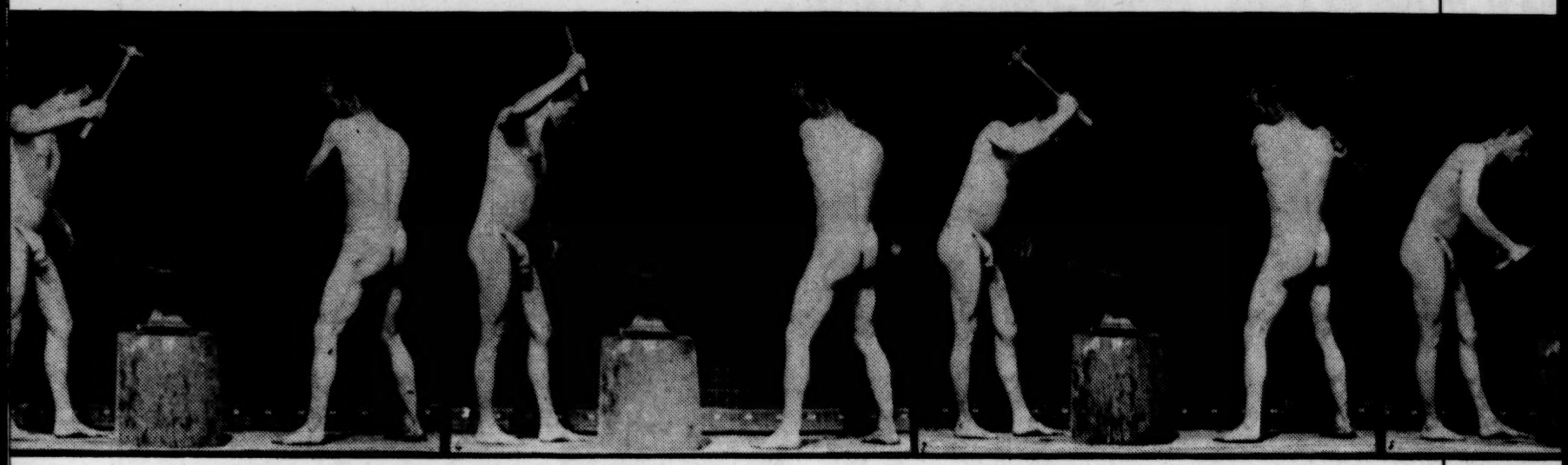
second — hammering, throwing, not to mention the swing of a golf club — feedback won't be of any help. Instead we have to plan such movements carefully in advance and then pump out the precisely timed sequence of muscle commands. Such ballistic movements require a "command tape" (the neural equivalent of the roll for a player piano) that is first planned at leisure and then executed without feedback.

The neural machinery for accurate throwing might also be available for more leisurely uses, such as planning and speaking a sentence, when not needed for ballistic movements (how many golfers or pitchers do you know that can talk while performing?). It might be available for holding memories of recent sequences, making it handy for analyzing a sentence spoken by someone else, or appreciating the rhythmic structure of a symphony. Music poses a particularly difficult problem for evolutionary thinkers, as it is so hard to imagine Darwinian influences shaping up four-part harmony — yet there are a lot of sidesteps in addition to straight-line evolution, so music and other such sequential skills might easily arise from the secondary use of neural machinery which natural selection shaped up for some other primary function, say throwing.

Throwing is a particularly interesting case because, unlike hammering or clubbing or leaping between trees, there is a final step in throwing that requires split-millisecond timing. To hit a rabbit-sized target from the distance of several parallel-parking spaces means that you have to let loose of the rock within a time window lasting only about 1/1000 second. This "launch window" is easily achieved by electronic timers but humans have rather noisy timers: the nerve cells that control the muscles are jittery, and the nerve cells up in the brain are even more jittery. So how do we manage anyway?

It turns out that many noisy cells are better than one! Many noisy nerve cells can gang up on the problem, averaging out their individual jitter, giving an illuminating example of emergent properties: committees can have abilities that no one member has. (There is indeed a whole family of emergents arising from what the mathematicians call the Law of Large Numbers.) Assigning hundreds of sequencing circuits to the same task can solve throwing's launch window problem, but the extra sequencers may have some other interesting secondary uses. I'll quote again from the river diary:

> "I got some requests from the after-dinner group to explain just what I meant by sequencers, and Rosalie provided the perfect example: the switching device that controls washing machine cycles. The schemata it sequences are all movements, called 'Fill, Wash, Rinse, Empty, Spin, Pause.' It can vary the duration of each cycle, can omit some if you like, perhaps repeat a rinse-empty sequence. The sequencers of the brain operate in fractions of a second rather than in minutes, but otherwise the principle is the same.
>
> "Suppose that we wanted, for some special occasions, a washing machine whose cycles lasted exactly ten minutes, right down to the split second. But that the available model of washing machine sometimes had an eight-minute cycle, sometimes an eleven-minute cycle — was, in short, jittery. There is a clever, though extravagant, way around this problem. We could take a hundred jittery washing-machine controllers and run them all together with one washing machine (such as by triggering a cycle whenever half of the controllers had agreed that it was indeed time to start up). This 'averaging' of the times in the hundred controllers will improve the timing precision by a factor of ten: if an individual controller jitters over a range of one minute, the tandem arrangement of controllers will jitter over only one-tenth of a minute. Want a hundredth-of-a-minute accuracy? Just use 10,000 controllers.
>
> "Now in between those very special occasions when you're feeling paranoid and want to wash your most delicate sweaters for exactly the time it says on the instructions, you'd have ninety-nine extra controllers that weren't really needed for anything. Suppose the schemata they could manipulate included sensory schemata such as books, flowers, boats, and boots, that they could try stringing them



together along with 'wash' and 'spin' to create novel scenarios. But that there was a 'realistic or not' censor that commented 'washing boats is a common practice, but washing books has seldom happened in your life so far.' Still, even if the scenarios from ninety-five of the idle controllers proved unrealistic, four might yield realistic scenarios, though each with a different 'quality' score. Suppose that you might just pick the one with the highest quality score for your next act? Is that imagination?

> "More candidate scenarios can make for more 'clever' animals. That's the sort of situation that throwing might have set up, simply via selecting for individuals that happened to have extra sequence controllers capable of being hitched up in tandem on special throwing occasions. Is that why humans have more consciousness than dogs? Or is there something more to it?"

Now one sequencer in the brain would be handy for various things (the dog trained to go out in the rain and fetch the newspaper), but it wouldn't subserve consciousness very well. Yet having dozens of sequencers buys a lot of what we call consciousness.

Imagine that tree-like marshaling yard as being on a model railroad layout, with a group of toddlers swapping cars from one track to another randomly,* the ready-to-go trains being judged as adequate or inadequate by some memory-based grading system, only the best of the approved candidates being let out of the marshalling yard onto the main line. Substitute words (or movements) for cars, sentences (or plans) for trains, and you'll behold a mechanical possibility for planning speech (and actions). You'll perhaps envision how the potent evolutionary combination of randomness-plus-successive-selection could operate in the mind. I like to call such stochastic sequencers "Darwin Machines."

Nearly a century ago, T. H. Huxley said, "We shall, sooner or later, arrive at a mechanical equivalent of consciousness." Now that we are starting to see a candidate, we need to ask just how much of our consciousness might such a many-tracked mechanism explain? Consider the foregoing quotations — and this conversation from the river diary:

> " 'And how many [sequences] can you keep going at the same time?' asked Dan Richard from the other boat. 'The most fascinating aspect of consciousness to me is the subconscious problem-solving that goes on as I go about something else. I think about what to buy Sue for her birthday, and I'm stumped. And then the answer pops into my mind when I'm eating dinner and talking about something unrelated.'
>
> " 'I don't know how many can be juggled in parallel. But the throwing theory suggests that you might have a lot of independent sequencers available in the brain, at least when they're not being forced to work in tandem for precision timing. Maybe only one can be connected to the language circuits at a time, but that's no reason other sequencers would need to stop making new arrangements of schemata,' I replied.
>
> " 'You know,' began Ben, 'that does sound a lot like dreaming. Those elaborate sequences that shift gradually into something quite different, hinging on some minor detail that brings forward a scene from some other story line. As if a second story had been running unseen.' " ►

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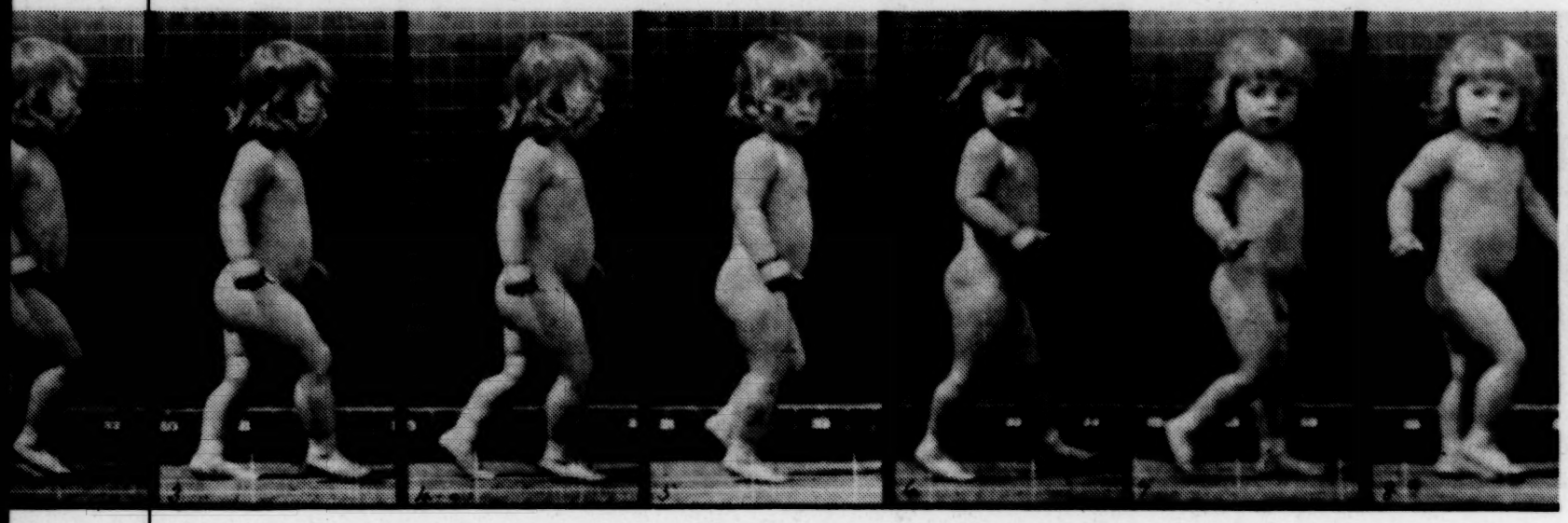
* Randomness has gotten a bad reputation largely through ignorance of its power: see Richard Dawkins's *The Blind Watchmaker* (Norton, 1986). My favorite examples of "purposeful randomness" concern movements. Randomizing directions is one way a bacterium in your gut finds food while swimming around: every so often, it does a wild, disorderly dance and then zooms off in whatever direction it is pointing at the end of the dance (rather like disorienting the blindfolded player who is trying to pin the tail on the donkey). By itself, this would be just a "random walk." But if the little E. coli is finding enough nutrients, it suppresses the dance and continues in the direction of more food — and so randomization plus selection yields "purposeful" behavior. It's just a faster version of Darwinian natural selection operating on the random mutations and permutations of the genes. A big improvement is to simulate the random-plus-selection act inside a brain, trying out some random possibilities, seeing what happens (at least as measured against memorized experience with such environments) and then acting on the best of them.



Thus the sequencer currently connected to the language system might be the talking-to-ourselves aspect of consciousness and foresight, but the other sequencers would still be hard at work subconsciously, busy piecing together other scenarios at random — most of them nonsense, when checked against our memories, but a few being realistic. Nighttime dreams illustrate sequences which haven't been carefully checked against memory for reasonableness — our many subconscious narratives are probably faulty in much the same sense.

That this mechanism looks very linear, very one-dimensional, seems at first glimpse not to explain the three-dimensional nature of much of our nonlanguage imagination. But it may be merely a matter of coding, as one-dimensional strings can represent multidimensional objects. Consider a three-dimensional object such as a house. It can be represented in two dimensions by a series of blueprints. Those blueprints can be sent across the country via a fax machine and telephone wires, temporarily coded in a one-dimensional string of binary bits, then reconstructed into two-dimensional blueprints by another fax machine, and then serve to construct another three-dimensional house. As long as you've got the neural machinery to make the translations, a one-dimensional representation is seldom an obstacle.

And my emphasis on one-dimensional sequencers (actually on parallel arrays of such sequencers, one for each muscle) is not meant to neglect the obvious two-dimensional representations in the brain, such as the maps of the visual world (not only is there one such map in primary visual cortex, but there are 20 to 30 additional secondary maps which have been found in monkey cortex). It's just that I think that evolution has provided us with an overblown number of sequencers, far beyond the number needed to control nonballistic movements, and so they provide the machinery to implement a Darwinian randomness-plus-selection scheme that operates on a time scale of milliseconds rather than millenia. When you add culture-based rules about word order to such multitrack sequencers, you get productive language. Other rules, and you get logic.

That's why I say that a number of independent sequencing circuits in the brain can potentially explain much of what we call foresight, free will, imagination, and the like (though not all of what's loosely called consciousness*). Useful though they are, such circuits may simply be a secondary use of something designed by evolution for another function more immediately exposed to natural selection during the long haul of the ice ages. Like a birthday present that arrived without an instruction manual, we're still trying to figure out how consciousness works, still discovering new uses for it. Consciousness may, in that phrase from the art world, be a "found object" elevated to a new use.

That presents some problems — and some opportunities. I'm reminded of John Steinbeck's analysis: 'Man might be described fairly adequately, if simply, as a two-legged paradox. He has never become accustomed to the tragic miracle of consciousness. Perhaps, as has been suggested, his species is not set, has not jelled, but is still in a state of becoming, bound by his physical memories to a past of struggle and survival, limited in his futures by the uneasiness of thought and consciousness." The foundation may seem insecure, but implicit in this view is the notion that we're still elaborating our consciousness. Our agenda was memorably set forth by Tom Robbins when he wrote, "Our great human adventure is the evolution of consciousness. We are in this life to enlarge the soul and light up the brain."

But the changing view of consciousness isn't just something that we can leave to the sci-fi fans and other enthusiasts. An understanding of how consciousness comes about — surely that will modify our concepts of responsibility and blame, our ethics concerning impaired humans, our scruples toward other animals. Humanity will change — and not necessarily for the better — unless we seize the opportunity to forge a more humane and secure foundation, based not only upon our new understanding of mechanism but also upon our looking-into-the-future assessment of what's desirable. ■

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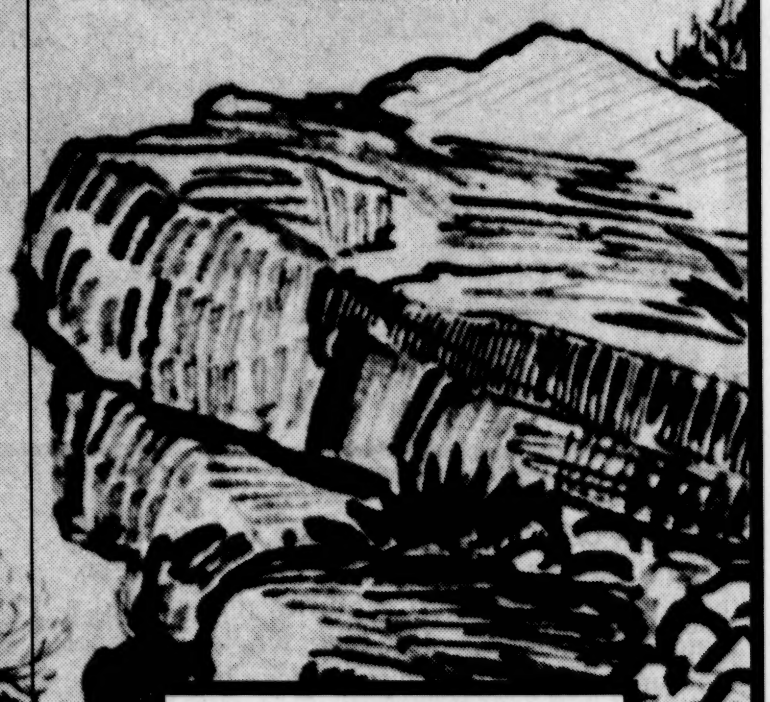
* Consciousness is a much-abused word, standing for many entirely different things; the neurologists use a very narrow definition (non-unconsciousness) and Zen uses a definition so broad that it encompasses plants. Julian Jaynes usefully analyzes such multiple meanings in the first section of *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Houghton Mifflin, 1976).

NATURE IS NOT A PARADIGM

BY MORRIS BERMAN



THE ORIGINAL TITLE of this talk was "Metapolitik," or that which lies beyond — or perhaps underneath — politics. We live in a time when the race is on to find a new paradigm for nature and a new politics to go along with this. All of this is very important, of course; there is a pervasive feeling today that the old forms have outlived their usefulness. Clearly, significant changes are in the air. This is a good development, it seems to me, and more to the point, an inevitable one. What I want to suggest in the following remarks, however, is the possibility that there is a deeper issue at stake; that we need to examine the *nature* of politics, and of paradigm, themselves, not simply find new replacements for old formulas. Again, I am not disparaging our current attempts to do these things, but I do wish to inject what may seem, at first, to be a curious note: that the search for new models itself needs to be cast in a different framework than it has been up to the present time in Western history, and that this may be the *real* watershed we are facing.

One possible definition of *Metapolitik* might be the epistemological layer of a culture that serves to hold that culture together and which underlies its political forms. The 48th hexagram of the Chinese oracle, the *I Ching*, "The Well," captures what I am after here when it refers to that which "is independent of all political forms," that which goes "down to the very foundations of life." In a similar way, the historian E. A. Burtt argued many years ago in *The Metaphysical Foundations of Modern Science* that the world view of any culture — by which he meant its picture of reality, its conception of nature

Morris Berman presented his theory of "The Body as History" at a Reality Club meeting in my living room on December 17, 1984. Maury is Professor of History, University of Victoria, and author of Reenchantment of the World *(Cornell University Press, 1981).* The Body as History *will be published by Macmillan in 1988. This article is reprinted, with permission, from the March/April 1986 issue of* Resurgence *magazine, where it appeared under the title "Metapolitik."*

The sketches are from Genius and Disaster: The Ten Creative Years of Vincent Van Gogh, *by A. M. Hammacher (Harry N. Abrams, Inc., New York).*

—John Brockman

— was its most important possession, its most significant legacy for future generations.

From time to time, I give talks in various parts of the world — or I should say, the Western world — and one thing I have discovered is that the different cultures of the West are really very similar. Of course, I notice important cultural differences between the U.S. and Italy, for example, or between Italy and France; but basically, I have very similar conversations in Munich, Paris, New York, and Rome. The only time I am confronted with a mode of discourse that is very different from my own is under four particular conditions (there may be more than four, but these are the ones that most readily come to mind):

1. When I undertake to study the pre-modern psyche and world view; for the example, the magical tradition of the Middle Ages. The essence of the magical tradition is the belief (observation?) that matter is not dead at all; e.g., that the Earth is a living organism; that it contains mind; and that, as a result, the appropriate discipline and operation of our own minds can alter that matter, make it move around, undergo transformations, etc.

2. When I encounter subcultures within our own culture that still live in that pre-modern mental space. Groups of witches, alchemists, and other occult practitioners exist, fairly invisibly (for self-protection), within our society, and hold very different views of reality than that held by the dominant culture. There *is* such a thing as a counter-culture and always has been, and the history of heresy shows this: Gnostics, Cathars, etc. But such groups need not be all that exotic. When I lived in the Greek section of Montreal, I discovered that my neighbors possessed a strong fear of the "evil eye," and had a specific oil-on-water ritual that was performed in cases when someone was believed to have been bewitched.

3. When I travel to those cultures that have escaped the effects of Westernization and modernization, at least to some degree. Of course, you won't find an alternative reality if you stay at the Bali Hilton. But if you attempt to communicate with the natives of Bali, Nepal, or even the Navajo of the American Southwest, you quickly discover that their central assumptions about reality are very different from your own.

4. When I take the trouble to explore my dreams. Here, the mode of discourse is affective and symbolic. Each of us, in this oneiric sense, is metapolitical as well as merely political, as the Surrealists have always argued.

My study of the history of Western science led me to conclude that the Scientific Revolution of the sixteenth and seventeenth centuries represented a major metapolitical shift; the whole mode of discourse changed. The biggest factor here was the demise of the magical world view, the loss of an affective and symbolic mode of communication. Nature was now seen as dead — a perception historians of science refer to as the "mechanical philosophy" — and this perception was quickly extended to everything. In the work of Rene Descartes, mind and body, subject and object, were taken to be radically disparate entities, and the world itself to be nothing more than a huge machine — something like a clock, wound up by the Almighty to tick forever.

At the same time, and not by accident, a political shift took place during the early modern period that was (for lack of a better phrase) "congruent" to all this: the rise of large standing armies, even in peacetime, and of the nation-state as the typical and most desirable political entity; the emergence of a cash/profit economy, especially in the wake of the Commercial Revolution of the sixteenth century, and later the Industrial Revolution of the eighteenth; the formulation of an ideology of progress, and an ethos of exploiting the Earth for

material gain; and the idea of government by contract, such as is obvious in the work of Hobbes and Locke and later, Voltaire and Thomas Jefferson. It is no accident that the science promoted by Hobbes and Locke integrated very well with their political positions. Hobbes' *Leviathan*, and his work on optics, are both part of the same mode of discourse, which is fundamentally mechanical in nature. Particles of light move around and impinge on the eye to create impressions and sensations; particles of society (i.e., human beings) interact with each other to generate larger social forms, such as governments. It is thus the case that modern science is not merely an ideology, but a *mythology*, and I use this word in a descriptive sense, not a normative or necessarily negative one. The term *Metapolitik* is thus an appropriate one for discussing the scientific world view of the last four centuries.

There has been, as part of this mode of discourse as well, a very dramatic impact on the human psyche; and here, I *will* be normative: much of this is not so good. To succeed in Western industrial society, it pays to behave mechanically, to ignore feelings and concentrate on appearance and behavior. This involves a repression of your dream life and of the life of your body, of your capacity to love. It seems to me that the very qualities that make for success in our culture make it very difficult to be vulnerable, to love others, and ultimately, even to love yourself. These are problems we all struggle with. And while it is clear that the *Metapolitik* of the last four hundred years has produced a very powerful civilization, technologically speaking, it is also clear that it has exacted a heavy price. It really is a question, in the last analysis, of what is meant by "civilization." Many years ago, on a visit to England, Mahatma Gandhi was asked by an eager reporter what he thought of Western civilization. Gandhi paused for a moment, smiled, and finally looked up at the reporter and replied: "You know, it wouldn't be such a bad idea."

One of the most important developments going on in our own time — perhaps *the* most important one — is that the age of the mechanical world view is now entering its decline. Many people now understand that something is up. We are in a curious position now, a kind of twilight zone. Dante said it of the last major metapolitical shift — the end of the Middle Ages — and it applies equally today: "In the middle of our journey through life/I awoke to find myself in a dark woods." It is clear that the old mode of discourse is starting to break down, and this leaves us, ostensibly, without any direction. It is also clear, at least to many, that if it is *not* starting to break down, we are doomed. Pushed to the limit, the view that nature is mechanical and that the world is dead has only one of two possible outcomes: nuclear holocaust, or the ecological annihilation of the planet. Many people are starting, if only privately, to realize that the price of the old paradigm, on a number of levels, is too high; they don't want to pay it. Three Mile Island, and Chernobyl, are *public* reminders; but we all have private reminders as well. Meanwhile, political leaders don't know what to do except to push on with the old paradigm, hence, the deliberate sinking of the Greenpeace ship *Rainbow Warrior* in 1985 by the French government or the formulation of the insane Star Wars program by President Reagan. And at the same time that we have nearly succeeded in wiping native cultures off the face of the Earth, we discover our inner terror, that if they die, so do we. Films such as *The Gods Must Be Crazy* or *The Emerald Forest* have done so well at the box office because, among other things, they capture an essential point: for all its technical limitations, the magical world view, the old or primitive mode of discourse, at least had reverence for life.

Of course, there are great dangers to this old mode of discourse; it has definite fascistic overtones, as a number of writers have pointed out. There is a legitimate worry here: neofascism lurks in a lot of

the celebration of the primitive, and there is no doubt that the Nazis were very interested in the primeval, the organic, and the occult. But we should not overlook the fact that Auschwitz was a very *scientific* event. I recall, as a child, the string of refugees that would float through my parents' house in the post-war period, and how, during the summer, when they wore short-sleeve shirts, I observed, with a kind of fascinated horror, the indelible ink mark, their concentration-camp number, imprinted on the inside of their wrists. There is no better example of Weberian rationalization, it seems to me, than the marking of every human wrist with an indelible number, the reduction of the person to an arithmetical unit. *Brave New World* is ultimately the logical endpoint of the mechanical world view and the mechanical *Metapolitik*.

As a result of all this, we are now living in a very tricky time. A new *politik* is struggling to be born, and this struggle is producing some very curious trends. I want to point a warning sign here as concerns two of these trends. The first trend is based in the idea that, as Weber pointed out, the flip side of rationalization is charisma. There is a great tendency today to try to escape from the *Metapolitik* of modern science by identifying with ecstatic experience; and as a result, a whole "industry" has arisen, organized around nonrational discourse. Typically, this activity gets identified with the leadership of one man — Rajneesh, the Reverend Moon, etc. — and the followers are blind devotees who have found salvation in their new sect and have largely abandoned any type of critical questioning as a result, while regarding themselves, at the same time, as "enlightened." Last year, poking through a bookstore in Munich, I came across a collection of American photographs of three decades ago in a book entitled *The Fifties*. One of the plates in this collection shows a young Billy Graham giving a lecture in Madison Square Garden, presumably before thousands of people, his eyes glazed as he exhorts his audience. Above him can be seen a banner, and on it the words: "I am the way, the truth, and the life." When you get down to it, what could possibly be worse than this? We are recycling the guru phenomenon today in a whole variety of New Age cults.

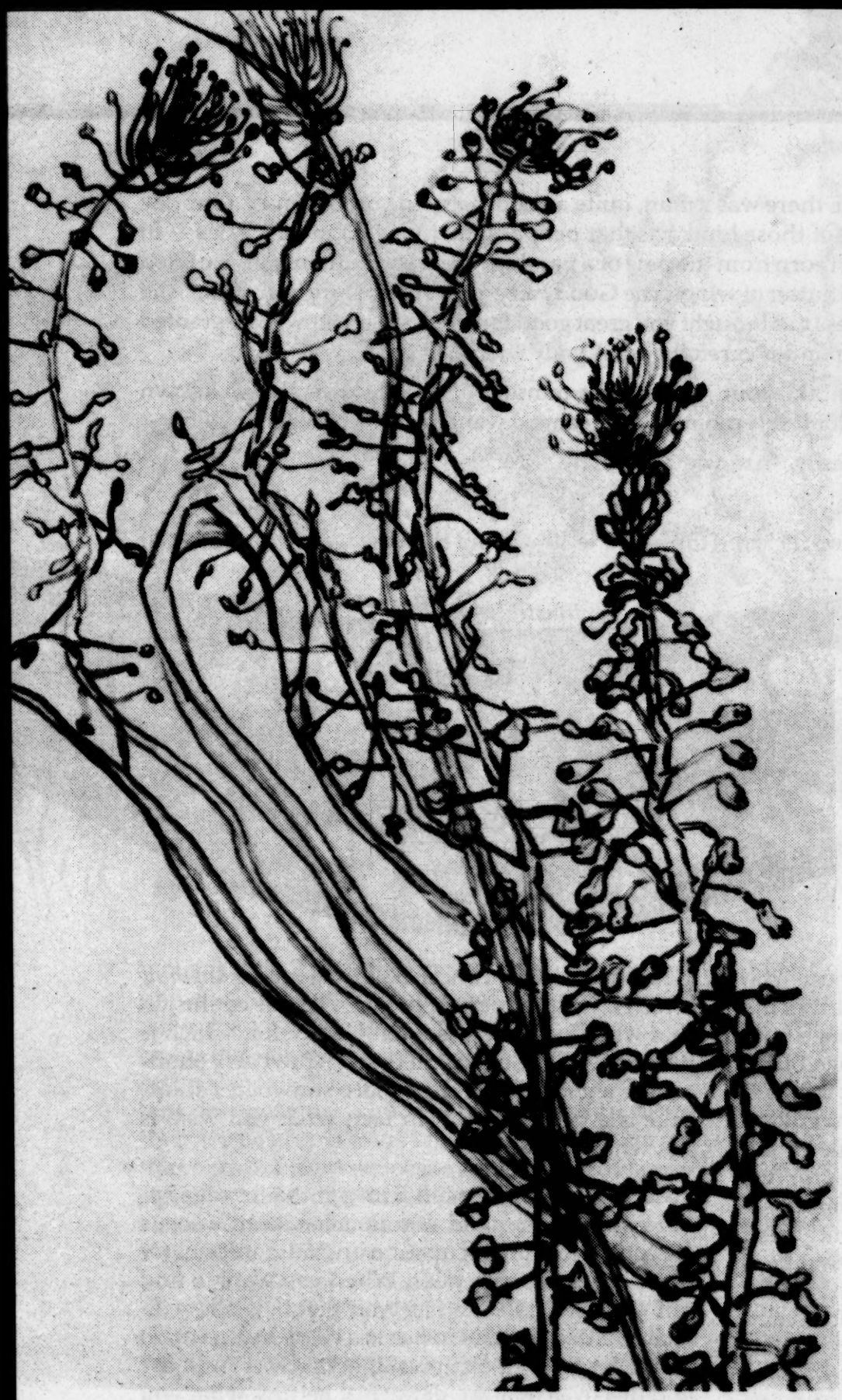
The second trend I wish to comment on is the rise of a new paradigm literature. We are now witnessing a deliberate and self-conscious attempt to construct a new mode of discourse. The New Age is filled with systems theory, holograms, morphogenetic fields, implicate orders, etc. We are urged to take a "cybernetic view of reality," to view life and nature as "self-organized information flow." Much of this is important; some of it may even be "true"; but the question I want to put to you is this: Is it *really* a break with the mechanical philosophy? Is the distance between Descartes and, let us say, general systems theorist Ludwig von Bertalanffy so great? I am not sure that it is. In both cases the *Metapolitik*, the world view, is disembodied: nature somehow gets left behind in a cloud of abstractions. Life seen as a "system" is not life actually experienced.

The new cybernetic world view is, like its Cartesian predecessor, still based on a mechanical metaphor. In Descartes' case it was a clock; for the New Age, it is a computer. In the last analysis, we are still talking about nature as a machine. That a computer is more sophisticated than a clock is neither here nor there.

We seem to be constructing a new "club," in which the names of David Bohm, Rupert Sheldrake, Ilya Prigogine and others will replace those of Francis Bacon, Rene Descartes, and Galileo Galilei. This is, for the most part, not *their* intention, incidentally; my general impression is that the majority of the new paradigm thinkers have no interest in cultivating a blind following or in forming themselves into a new intellectual elite. Yet that seems to be happening nevertheless; and if it *does* occur, the question to ask is: So what? What have we really accomplished by replacing one set of elites with another? Maybe the real challenge is to get beyond the idea of clubs, intellectual in-groups, and elites, altogether.

Finally, I believe that much of systems theory and the new paradigm literature represents a fear of the body, a fear of our dreams and of an older mode of discourse. This was surely the case with the mechanical philosophy; is it not true of much New Age *Metapolitik?* The point is well made by Ronald Laing in one of his recent books, *The Voice of Experience*. Laing writes: "It was all a machine yesterday. It is something like a hologram today. Who knows what intellectual rattle we shall be shaking tomorrow to calm the dread of the emptiness of our understanding of the explanations of our meaningless correlation?" We continue to be more interested in our explanations of reality than in reality itself.

To conclude, let me return to the bookstore in Munich. In addition to the photo of Billy Graham, it also had a lovely collection of Hebrew postcards. These showed paintings of scenes from nature: the sun at high noon, wheat growing in a field, and so on. On the postcards were captions such as, "What does the sun say?", "What does the wheat say?", and other similar expressions. There is a Buddhist notion here of the direct awareness of nature, the phenomenon of bare perception that perhaps we need to cultivate. It seems to me that the game we are playing can only be won by being given up. Somehow, we have to get beyond



It seems to me that the game we are playing can only be won by being given up.

paradigm itself; this would be a true *Metapolitik*, in the *I Ching's* sense of going down to the very foundation of life. John Keats, the English poet, in a letter to a friend, coined the phrase "negative capability," by which he meant the ability to tolerate ambiguity, to hang out in a space of uncertainty without frantically searching for answers and explanations all the time. Installing a new paradigm in place of the old one, nailing down a new belief system as fast as the old one crumbles, will surely prove, a hundred years hence, to have been a big mistake. We did that before; why do it again? It seems to me that we have a unique opportunity today, namely to look at the nature of paradigm itself, and that this is a vastly more exciting option to take. Some time ago I read a poem that hints at what I am talking about, by Cambridge mathematician G. Spencer Brown.

The Opening*

Once every 500 years
The gates of heaven are opened
Just a little way
Just a little light
Just a little
Just enough
Soon
They will close again
Bang
Clang
Missed it
Ah well
Another 500 years.

I can't avoid the feeling that if we fail to do this, if we fail to look between worlds, to examine the nature of paradigm itself, to examine the nature of our desperate *need* for total explanations and world views, something very important for our cultural development is going to be missed. As the Jungian writer and therapist Ira Progoff recently put it, our challenge is not the invention of new world views, but rather learning to submit to existence in a spirit of openness and trust.

Perhaps the only trustworthy world view is the world itself. ■

*Reprinted by permission of Bantam Books.

ONCE UPON A TIME there was a man, quite a good-natured sort of a man. One day he performed one of those kind acts that people sometimes do in fairy tales — in fact, he removed a thorn from the paw of a passing retriever. Suddenly music filled the air and, with a flutter of wings, the Good Fairy appeared before him. "Sir," she said, "your kindness has brought you great good fortune. You are now to be granted a single wish, so ponder carefully what your wish will be."

"I don't need to think about it even for a minute," he said. "I've always known what I would ask for if this moment ever came. I want my cock to reach the floor."

The Good Fairy shuffled her wings uneasily. "Are you absolutely sure?"

"You better believe it," he said.

Thunder rolled, trumpets blasted, rainbows flickered through the air . . . and there he was, with NO LEGS.

illustrated by Barbara Beaver

The Revenge of the Good Fairy

BY MARY CATHERINE BATESON

This is a joke rather than a fairy tale, but those who grew up on folk tales and mythology have met the story before, in hundreds of forms. They range from the story of King Midas, who asked for the golden touch and found himself unable to eat or to touch those he loved without turning them into golden bric-a-brac, to W. W. Jacobs' ghoulish tale of the "Monkey's Paw," in which a couple wishes for two hundred dollars and then receives it as compensation for the death of their son in an accident. Later, they wish him back to life only to realize that he is so horribly mangled that they quickly wish him the peace of death. Besides these, there are more comical stories, like the story, used by Freud in his discussion of wish fulfillment, of the quarrelsome couple granted three wishes: the greedy wife wishes for sausages; the husband, outraged, wishes them attached to her nose; and the last wish must then be used to get back where they started. More? There were the peasants who wished for beardless grain, and found it eaten by birds. There was the frog that wished to be big as an ox and burst, and then there were some other frogs that wanted a king and were eaten up. Most people can think of further examples.

Tolly Holt said years ago [in *Our Own Metaphor*], "It's the idea of the conceivable existence of *anything* which is independent of process. It's the confusion that what I strive for is what I strive for, which is nonsense . . . The illusion that if strawberry shortcake is a good thing, then more strawberry shortcake is a better thing." In fact, what you wish is not what you wish.

We are dealing here with a matter that evades apparent tautology, and one that has been a focus for continuing preoccupation and admonition, for these are cautionary tales. When you want to find out whether there is a reservoir of folk wisdom on some matter, the tool to use is a *Motif Index*, which will allow you to look up a subject such as "wishes" and discover that the danger of getting what you wish for has been perceived from Native America to China, from Classical Greece to Australia. There seems to be an ancient folk wisdom that asserts that what you want is not what you want and what you *get* is not what you want either.

There is a familiar Freudian explanation for this phenomenon. Infants experience strong and often destructive desires for things that would be dangerous or undesirable — the death of parents, for instance — and must outgrow or repress much of

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Mary Catherine Bateson talked to the Reality Club about "Privacy and Biography" on February 23, 1985, in my living room. She is Professor of Anthropology, Amherst College, and author of Our Own Metaphor *(Knopf, 1972),* With a Daughter's Eye: A Memoir of Margaret Mead and Gregory Bateson *(Morrow, 1984), and, with Gregory Bateson,* Angels Fear: Toward an Epistomology of the Sacred *(Macmillan, 1987).*

—John Brockman

Any dream, taken literally, is likely to be destructive.

that wishing. The experience of ambivalence is so universal in human life that we must be grateful not to be omnipotent (the problem of an omnipotent being — god or parent or child — suffering from ambivalence is like that of the chameleon on the tartan). Furthermore, children must over time bring their wishes for various kinds of pleasures under the control of the developing ego, the "reality principle," and learn such skills as deferring gratification. The familiar stories are the vehicles of socialization in these areas.

This essential piece of folk wisdom has apparently eluded our culture. We can easily point to cases in which technology has gone awry and use this joke as a parable of the dangers of technology. After the engineers and technicians have taken some age-old human desire and made it come true, we find ourselves with something that doesn't correspond at all to the remembered vivid longing. The longing for immortality is not satisfied by the possibility of artificially sustained vegetative life or by cryogenics, and even the dream of flight is a far cry from the transport we experience in a sealed container, breathing stale air as we go, after endless delays, from one identical airport to another. The Good Fairy must laugh at our inept wishing.

An even more striking example is provided by Reagan's Strategic Defense Initiative, "Star Wars." The desire for a perfect protective shield has a suspiciously mythic quality, balancing the desire for the perfect offensive weapon that got us into trouble in the first place. Mythic heroes, if they are lucky, are often simultaneously given a magic weapon (say, a sword or lance) and a magic defense (a special shield, or a protective ointment, or the gift of invisibility). Anyone who doubts that the underlying themes of Star Wars are mythological has only to look at some of the early descriptions of a possible system. In the fall of '85, for instance, designers were talking about a defense in *seven layers*. The concepts were simply not developed enough at that stage to provide a rationale for that exact number; rather, some scientist somewhere knew, probably at an unconscious level, that it was all magical thinking anyhow, all hocus pocus. Star Wars, if it is deployed, will match perfectly with the revenge of the Good Fairy: it won't work and will at best partially match the desire; it will have horrendous and unanticipated costs; and it will increase the danger of nuclear war from which it was intended magically to protect us. Star Wars matches the joke in yet another way, because it reminds us of the phallic quality of so much fantasy, where "defense," like "security" and, of course, "intelligence," is a euphemism for aggression.

But the fact that technology can disappoint and betray is not news. The problem here is not to examine a series of horror stories, but to ask about the relationship between these stories and the patterns of human decision and action. If it is the case that not only is what you want not what you want, but

also that, at some level, we already know this, what is the lesson to be learned? One possibility to consider is that, poor forked creatures that we are, with ambivalence built in to the deepest levels of our personality, we insert the worm into the apple and the weakness into the O-rings ourselves, building the faults into all we do, and this is not avoidable. We have been increasingly committing our lives and the health of the planet to technologies that require perfection, and yet there is good reason to believe that we may sabotage them deliberately in an unconscious reassertion of the truth of fallibility. After all, if only we could learn the lesson of fallibility from the space shuttle disaster, that learning might save our world, and yet the whole machinery of investigation was oriented towards proving that the errors were so specific and exceptional as to make it possible to assign blame and regain the illusion that such errors could not occur in the future. We may have to find ways to reclaim the ancient wisdom intended to protect human beings against fantasies of omnipotence, and to make a virtue of fallibility.

This then is one side of the story — the fact that human beings carry with them ambivalence that is a necessary byproduct of a human childhood. The other side of the coin is the fact that this ambivalence may be both adaptive and necessary. The cases of the revenge of the Good Fairy that occur in human affairs have certain systematic characteristics in common. Thus, there are a great many instances in which supposed solutions simply move problems up to the next level of systemic determination, so that the Green Revolution promotes population growth, insecticides and antibiotics promote immune strains, and legislation to control pollution produces acid rain. A very large range of examples of the revenge of the Good Fairy involves the logical types: the attempt to solve a problem at an inappropriately low logical level pushes the pathology up to the next level where it may be much harder to deal with. The question arises whether the repression of ambivalence and the inability to think systematically are related, or whether these two issues are different and simply coincide in some cases.

TO BEGIN WITH, we should note the fact that in nature, effort often seems one-sided, as long as you look at the single organism, for a component of the organism is balanced by a characteristic of the environment, with the two together forming the unit of survival. When humans gain the capacity to make our desires effective, we are like people who have been walking against a high wind, leaning into it: when the wind drops we risk falling over. In fact, just as children necessarily have desires whose fulfillment is prevented by their caretakers, organisms are necessarily genetically programmed to strive for things that would be bad for them, which they are prevented from obtaining by some characteristic of the larger system. This is not limited to human beings, but provides the basis for pathologies that are largely special to our species.

Individual survival and reproduction both fit this model of one-sided striving. Death itself is something we might wish away, with disastrous results. Individuals resist death and, in human culture, physicians are programmed (culturally) to struggle against death, because this has been a battle impossible to win. Death has been the one thing they could count on. We have not in the past needed to insure our own dying.

Similarly, all species produce more offspring than are needed for replacement, and in most cases produce numbers of offspring that, if they were to survive, would shortly render the environment uninhabitable. But controls on overbreeding are not only in the breeding animals but also in the predators and parasites and other problems posed by the environment. Thus it is that those advanced species that care for their young make great efforts to ensure their survival — and yet at the species level, survival depends on the death of substantial numbers, sometimes a majority.

Staying alive begins to look like a pathology of immoderation, like an excess of strawberry shortcake, and yet all pathologies of immoderation must be one side of the coin of survival. We must ask, for instance, why it is that human beings (and some other species as well) may make themselves sick by overeating but not, in general, by drinking too much water or inhaling too much air? Some drives must be self-limiting in the individual under nor-

It may be that the stop-frame view of the self is an illusion that parallels the crop-frame view that excludes the environment.

mal circumstances, because they are not limited by the environment (cows rarely graze themselves sick), while others may be unlimited in the individual precisely because the environment provides the limit. The instruction "Eat" is clearly more economical than "Eat until you reach satiety," because in the second, a mechanism must be provided for the recognition of satiety.

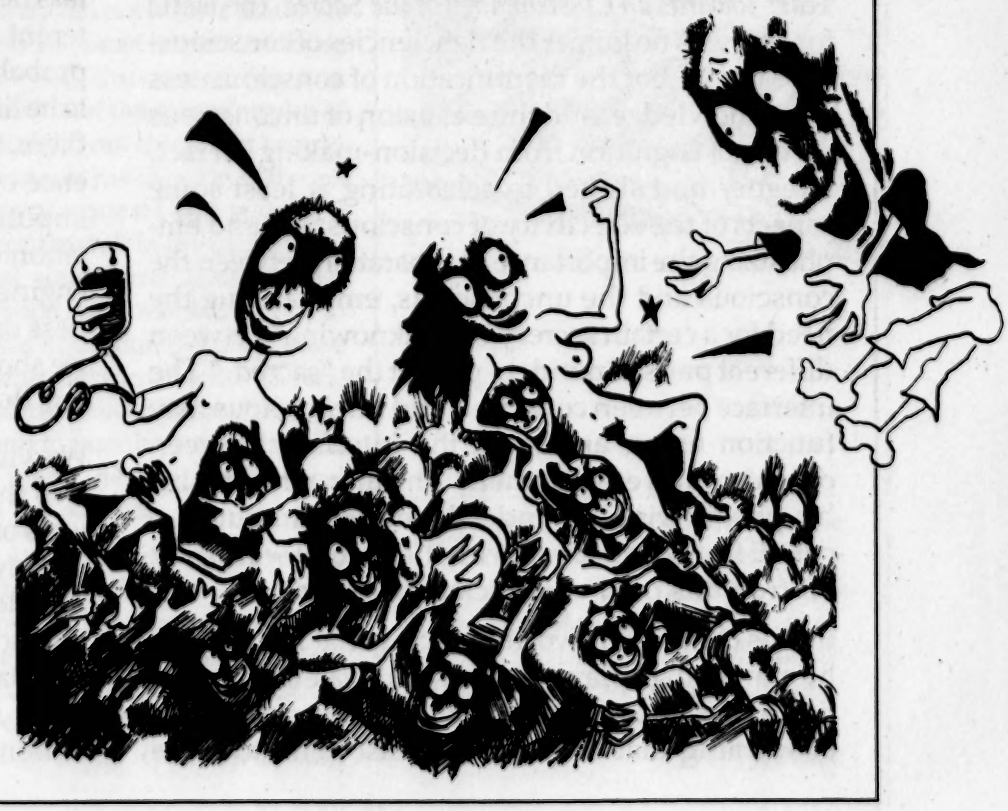
Furthermore, there are situations in which excess is healthy. Humans living under circumstances of scarcity gorge themselves when they get a chance, because the body has a certain possibility of storage, and so it is that under circumstances of plenty most of us put on weight. Human beings, because they can carry things, have had the possibility of hoarding outside the body for millenia, and we seem to be programmed to want more than we need — just in case. This may provide the answer to why it seems to be so difficult to determine when one is *rich enough;* people of all levels of prosperity, even the very rich, will frequently explain that if they only had 30 percent or 40 percent more, they would have "enough" . . . and as for me, I am sure I only want one more potato chip to satisfy my body's conviction that it had better get salt while it can. The Department of Defense is convinced that safety lies not in parity but in being just a bit stronger than the Soviets, and the Soviets have a symmetrical conviction.

All of these cases — resisting death, over-breeding, hoarding and gorging — are expressions of biological drives that are, under natural conditions, one-sided because the control is provided by the environment. Regenerative mechanism within the organism may normally be controlled at the environmental level. These are cases in which the paradox of "What you want is not what you want" is resolved by pointing out that there are two different levels to the word "you": what you_1 want — as a system consisting of a single organism — is not what you_2 want — as a system consisting of organism in environment. Of all the Good Fairy stories, the myth of King Midas is perhaps the most poignant, because what Midas suffers is precisely the fate of being cut off from his environment — from those exchanges necessary for life and happiness — because his error is the assumption that he can prosper in separation from the environment. The man in the joke, if he had his longed-for oversized penis, might find himself in some difficulty interacting as well.

We have not yet exhausted the repertoire of types of wishes. Others that come to mind are youth and sexual pleasure. In the stories, eternal youth is a disappointment because of the pain of losing loved ones. The stories assume an inability to form new relationships — that the freezing involved in ceasing to age also involves ceasing to learn, grow, create new involvements — that change through time is extraneous. It may be that the stop-frame view of the self is an illusion that parallels the crop-frame view that excludes the environment. One useful approach to the recognition that what we value in others involves continual change is to consider how quickly the care of a severely learning-disabled child becomes burdensome — childhood evanescent is entrancing, childhood partially stagnant far less so.

With regard to sex, it is often speculated that marriage (and monogamy) are female inventions — that women wish to domesticate men, which is to say that they wish to persuade them to behave as parts in a larger system. Women apparently see sex as an essential process in that larger system, an ongoing basis for bonding, while it seems to be more common for men to externalize sex and not see it as creating (and sustaining) relationship. One of the ironies here is that if unlimited sexuality is a widespread human dream, AIDS does come to look rather like another variation on the revenge of the Good Fairy. There is a familiar kind of irony in the symmetry between the rapid dissolution of so many boundaries maintained by custom and the collapse of the body's own capacity to repel invasion.

I have not listed wishing for power separately, for



all wishing involves power in some sense, power over nature, power over others, power to get what you want, power to prevail, even power to help. But the expression of wishes in terms of the notion of power is a way of highlighting the centrality of the illusion of being separate and *outside* the system over which one wishes to have power.

ARGUABLY THEN, ambivalence is the mirror image within the person of certain characteristics of hierarchically organized systems, where the individual is a subsystem in some larger system. When the individual wishes too efficiently, he may disrupt the larger system — and his entire wish-mechanism may have evolved to push against environmental constraints, but not to succeed. When the individual who has matured under these circumstances finds himself suddenly able to make wishes come true, he may subvert that possibility. Phrasing it rather differently, we could say that ambivalence is not only a neurotic residue of childhood but a form of wisdom, a memory of what it is to be a part of a larger whole. Kierkegaard once said, "purity is to will one thing," but it seems possible that a divided will is the beginning of wisdom.

Back in 1968, my father Gregory Bateson argued in preparation for his Conference on Conscious Purpose and Human Adaptation that a large number of the pathologies occurring between human beings and their environment might have to do with the phenomenon of consciousness, because consciousness is incomplete and selective, and this selection is dictated by considerations of purpose, specifically, that "the cybernetic nature of self and the world tends to be imperceptible to consciousness." In our collaborative book that appeared this spring, *Angels Fear: Towards an Epistemology of the Sacred*, the issue for him was no longer the deficiencies of consciousness per se, but the identification of consciousness with knowledge, and the exclusion of unconscious modes of cognition from decision-making. In fact, Gregory had shifted to celebrating at least some aspects of the selectivity of consciousness and emphasizing the importance of separation between the conscious and the unconscious, emphasizing the need for a certain secrecy or "unknowing" between different parts of mind, to protect the "sacred." The interface between conscious and unconscious may function as an analog to the interface between organism and environment. The man who obtains his phallic wishes is indeed a double amputee — cut off from connection with the natural world, cut off from his own unconscious wisdom.

In this context it is worth noticing that not only do human beings play out their ambivalence in relation to their most cherished dreams, the nightmares of warning that they hold up also tend to come about. *Both* Armageddon and Heaven on Earth are likely to turn out to be nightmares. It might be argued that the twentieth century is the century in which God turned literal-minded, displaying a fundamentalism more pernicious than the human variety, and gave mankind, in concrete and factual form, one after another of the dreams gestated through the centuries. But of course it is the human species that has been diligently implementing fantasies that should never have been taken literally. Nuclear weapons are one kind of dream come true, concretized poetry. They represent not only the wish fulfillment of a super weapon, but also a dream of human unity. The planet is now, more truly and completely than ever before, one, united by risk (and by pollution and by communication). The holocaust was another kind of dream or nightmare come true.

In order to live with necessary ambivalence, we need to reassert the value of fallibility, to deny the infantile wish for omnipotence that is contained in every technology that must not fail.

In order to live with necessary ambivalence, we need to reassert the value of fallibility, to deny the infantile wish for omnipotence that is contained in every technology that must not fail, lest its failure resemble the revenge of the Good Fairy. If we could assert the value of fallibility, we might learn never to build a dam or a reactor or a defense system unless its ultimate failure was an acceptable risk. The tragic loss of a ship and crew, like the space shuttle, is different from the risk of accidental war, and should probably be regarded as an acceptable risk — one to be limited more effectively than it was, but always there. Simultaneously, we need to accept the presence of error in all human enterprises, instead of imputing, as our lawsuits increasingly do, an expectation of infallibility to all-too-human doctors and engineers. This does not mean endorsing carelessness or criminal negligence, but it does mean that we should be grateful that neither Mephistopheles nor the Good Fairy has granted infallibility.

We will not stop dreaming and wishing, nor will we lose the notion of perfection, but we need to find ways of remembering that any dream, taken literally, is likely to be destructive. There is a tradition among Middle Eastern rug weavers, for instance, that every rug, no matter how fine and opulent (and every rug is metaphorically a garden and an analog of paradise), should contain a deliberate error, for perfection belongs only to Allah. ■

Why Should I talk to You?

A Nonfiction Writer Responds to His Reluctant Sources

BY STEVEN LEVY

I'M A NONFICTION WRITER. The book I'm working on requires me to talk to a lot of people. For many of them, the book concerns a subject they least like to talk about. So it's always a tense moment when I call up potential sources, tell them what I'm doing, and ask if they will cooperate with me.

Briefly, the book concerns the story of Ira Einhorn. During the sixties he was known as the "hippie guru" of Philadelphia — he was a counterculture leader who took cues from Ginsberg, McLuhan, Leary, and the Yippies. As the sixties petered out, he shifted his activities towards creating a community of ideas within the system. He was a significant figure in the beginnings of what is now called the New Age. His notable contribution was the creation of an informal network wherein he circulated an eclectic selection of papers, articles, and books among an impressive group of scientists, business leaders, New Age-ers, and writers. In 1978, he served a fellowship at the Kennedy School of Government at Harvard, and he seemed to be establishing an unorthodox, yet estimable career. This career was effectively halted in March 1979 when the police came to his small apartment with a search warrant and discovered the corpse of his former girlfriend. Einhorn claimed he was framed, and indicated that the deed was done to discredit information he was circulating in his network. Before the matter came to trial, he jumped bail, and is still a fugitive.

The deceased was a shy, beautiful Texas woman who had lived with Einhorn on and off for five years. Her story is itself compelling, and I've discovered that her life made an indelible impression on not a few people. As did Einhorn's. So the people I am relying on for the information that will enable me to write this book are, more often than not, emotionally involved with one or both of the subjects. In some cases, they would prefer that this connection be forgotten.

Though many welcome the chance to share their thoughts and memories, others are obviously unhappy at my call. I try to explain what I'm doing and why their help would be beneficial, but quite often their objections boil down to a simple question: "Why should I talk to you?" After all, it is a difficult story to relive, and I do not offer money or any kind of guarantees.

Tom Wolfe once said that journalists should not attempt to do in-depth work if they did not believe that their work was the most important thing in the world, thus overriding any consideration of the source's point of view. But I did not think that I could use this as sole justification of the extraordinary request I was making. I tried to put myself in the place of my potential source and asked myself the question, why *should* they talk to me? It was a question worthy of more than some glib comeback — in fact, it caused me to reconsider what I was doing and to examine whether it did in fact merit the cooperation and trust of my sources.

I won't keep you in suspense — I concluded that, yes, my intentions and aims do justify my requests. But in the process of re-examining my work, I found a handle to explain to others exactly what the work of a nonfiction writer consists of, and

"Why Should I Talk to You?" was the title of the talk Steven Levy delivered to the Reality Club meeting of December 5, 1986 at The New York Academy of Sciences. Steven, a nonfiction writer, is the author of Hackers: Heroes of the Computer Revolution *(Doubleday, 1984).*

—John Brockman

how I try to depict the odd kind of reality that is reconstructed in a literary, nonfiction book.

Name That Genre

My writing falls under the rubric of Contemporary Nonfiction. Some people call it "Literary Journalism." In any case, literary techniques are important in presenting material, but not nearly as important as truthfulness. This means not just using facts, but trying to find out all the relevant information and presenting it in a coherent fashion. Nothing can be made up.

Now, because of cynicism, or fallout from the Janet Cooke* scandal, or the routine distortion of TV movies and docudrama — I don't know exactly how — that simple fact is greatly misunderstood by many of the people I seek as sources. One -- a close friend of Ira's who was himself a fine writer — kept referring to my work-in-progress as a novel. I don't think he was doing it to needle me, but it did make me a little crazy, because the heart of my work focuses on the distinction between novels and nonfiction accounts of stories that lead one to say, "This is interesting enough for a novel." I write nonfiction because I think it's *more* interesting than a novel is.

A novelist invents or appropriates details and events, whereas a nonfiction writer is stuck with reality. When you make up a story, the bedrock moral can often be stated in one sentence. (Hollywood loves stories that can be summarized in that fashion.) But as a nonfiction writer gets deeper into material, he realizes not only that real life cannot be so easily packaged, but that the complexity is almost always more compelling than the preconceptions one tends to get before researching a story.

That's why those TV "docudramas" are so bad — they are usually adaptations that try to follow a plot-line that can be summarized in twenty words or less. Trouble is, real life doesn't conform to a one-sentence plot summary. Learning that is the most important lesson a nonfiction writer can learn. I've found that the things which confound the one-sentence summary can be very useful keys to a deeper understanding of what's happening. As you get into the intricacies of a real-life story, it begins to look incredibly complex, so much so that there's usually a period of despair that nothing coherent will ever emerge. But inevitably, if you work hard enough and talk to enough people, you get more and more pieces of the mosaic. And a picture begins to form.

As far as the reader is concerned, nonfiction has a different impact than a novel. Let's take a simple example: a case in which someone refuses to allow his graduation picture to be printed in a high school yearbook. In a novel, you might note this detail and ask, "What is the writer trying to say here, and is it true to the rest of the character portrayal?" In nonfiction, you know that it really happened, and the question is different. "What does this say about the *person?* Is it a relevant fact considering that person's fate?" It does make a difference.

But when you're researching it, your potential sources don't care about these matters. All they know is that someone's getting information, asking them to talk. And a very complex relationship begins.

*The *Washington Post* writer who faked an account of a young heroin addict.

The Source and the Writer

I don't want to give the impression that every interview I conduct is preceded by a soul-searching. Most people, amazingly enough, agree to talk with little or no hesitation. Often they don't bother to check out who I am or what I'm doing. This is as true in this project as others I've worked on.

Why does someone cooperate with a writer?

In some cases, sources have a potential material gain. They could be selling something — maybe they have a book they want publicized. Or their careers might be helped by publicity, even notoriety.

Ego is frequently a factor. In the minds of some, appearing in an article or book lends them importance, and often during interviews I find it healthy to maintain a skepticism whether my informant really was as prominent in the story as he or she implies.

Then there are those who talk to a writer mainly because they want to make a point. They believe that the story says something about the subject, or a certain group, or life itself, and cooperate mainly to insure that the writer will see things their way. The point of view may or may not agree with the writer's, but I think it's always valuable to hear it.

Others talk simply because they want to be helpful. People are generally sympathetic to someone on a quest, particularly one that is as intrinsically interesting as getting to the bottom of a murder accusation. And for many, it is difficult to say no, even if their instincts are leaning against it. On those few occasions when I have found myself on the other side of the fence, with reporters asking me questions, I am startled to observe the lengths I'm willing to go to assist them.

Now, are these the "right" reasons for sources to yield to a reporter's demands? Well, writers don't look gift sources in the mouth — they turn on their tape recorders. Any reason that people talk is fine. Generally. Sometimes, though, if I think that sources are being naive, I want to warn them of what they're doing. I don't want them to read the book later and think that things were tricked out of them. If a source somehow assumes that certain things are off the record, just because in the source's mind they *should* be off the record (this happens), and I realize that this is the case, technically I'm following reportorial ethics. But the spirit of these ethics is something else. In that case, I am bound to point out that, unless otherwise specified, I might use anything they say.

There's a simple guideline for a writer's behavior in these matters. Just ask yourself if your sources, assuming they're reasonable, are going to think you swindled them. Or will they say, even if they dislike what's there, "Well, at least he treated me fairly. He never told me he was going to say this, or not talk about that."

But those are issues that arise after people agree to cooperate. What brought me to my musings was what happens when sources *won't* talk. The reasons for talking don't apply — and they certainly aren't reason-

able incentives to convince people to change their minds and cooperate.

Why not? Well, you *can* point out where a source might harvest some material gain from cooperation. But that puts you in a quasi-business relationship with your source, an extremely undesirable position. So I don't think it proper to say, "If you talk to me, you'll sell a lot more books," or, in the case of a private detective who worked on the case, "This will make you look like a hero and get you more business." That's an implicit promise to actually do that, and those *quid pro quos* should be avoided at all costs.

You *can* also play up to a person's ego. And let's face it, there's no way I'll *insult* someone. But I resent buttering someone up, and much of the time people are smart enough to see that coming. If they do, they will rightfully resent it.

Now, there are also potential negative incentives. While it certainly is unethical to imply that you will treat someone unfavorably because they refuse to talk to you (and unforgivable to go ahead and do it), the fact is that sometimes that warning is accurate. Often I have information that, on the face of it, puts someone

in a poor light, and hearing that person's explanation will mitigate the effect. In those cases, it is fair to point it out. I prefer to put it more positive ly — "Here's your chance to interpret what might otherwise look bad."

Good Reasons For Not Talking

What I'm talking about now are pragmatic considerations. Ultimately, those will decide whether people talk to me or not. But I was wrestling with a bigger question, remember — to answer why they *should* talk to me, manipulations and negotiations aside. To do this I had to weigh the value of what I did against what I considered the key reasons that some people *don't* want to talk to me.

Some simply think that talking won't *help* them, and therefore it's a waste of their time. One former sixties activist put it rather succinctly: "I don't see how this will be to my advantage," he said, implying that any interaction which didn't provide tangible benefit was out of the question.

Others have legitimate concerns about their privacy; they understand that their information might be important to me, but think that some things are best left alone. There are those who are embarrassed by their role and do not want to recount it publicly. In some cases, they feel that disclosure of the information could have real repercussions — even if the possibility is slight, they don't want to risk it.

Others have frankly told me that they suspect that the material will be exploited. Probably due to publicity from a few lucrative books and movies on similar subjects, a popular misconception is that anyone involved in these activities is getting rich from them. Occasionally, a source even offers cooperation if and only if he or she is included in this presumed reward. But money is not the main point here — the fact is that there has been a tragedy, and my book, like it or not, would not exist if that tragedy had not occurred.

One source, a former lover of the murdered woman, had just completed an emotionally draining interview. I was startled when, as we were parting, he glumly expressed a doubt that I could ever relate this story without in some way exploiting it. "How can you avoid it?" he asked.

Exploitation vs. Illumination

That question brought me back to the original dilemma. I think that the kind of journalism I'm performing — journalism dealing in private matters suddenly cast in a public light — can follow one of two paths. These are exploitation or illumination.

When people use the word "exploitation" in this sense, I think the definition they intend is not "To employ to the greatest advantage," which is what we like to think of as the American way, but a second definition, "To make use of selfishly or unethically," which also may be the American way, but is frowned upon in person-to-person conduct.

"To make use of selfishly or unethically." That sounds *terrible!* Is *that* what I'm doing?

To answer that, let's examine my motives. What drew me to this story? And in a larger sense, what draws me to nonfiction?

This particular story attracted my attention because it touched on several things that were important to me. It occurred in Philadelphia, my home town; I had even attended the same high school as Einhorn. But my interest was fueled mainly by the connection of the story to the sixties and the cultural/political changes of those times. What was the lasting impact of those times? Could this tale tell us something about the human residue of those changes? For me, this was a story that resonated beyond the boundaries of the people involved.

I think this is true for nonfiction in general. I believe that if you examine *any* human story closely enough, you reach essential truths about *every* person. The trick is to find the stories that are both interesting from the outside — enough to keep you motivated to keep digging to the inner story that is universal — and have enough pathways for you to get to that inner story.

One reason so many good books — as well as bad ones — focus on murders is that they are intensified stories of the human drama suddenly thrown into the public domain. Formal investigations begin. Records are kept. People sharpen their memories about incidents that otherwise would be forgotten (though in some cases people repress memories). And people have to grapple with the dark side of human nature.

One fascinating issue that I've come across here is the fairly overwhelming consensus of people who say to me, on the assumption that Einhorn did kill Holly Maddux, "Well, of course anyone is capable of uncorking and killing someone in a relationship." On one hand, it makes sense — who has not been so angry that they could shout, "I want this person dead!"? On the other hand, I want to say "Wait a minute — I know a lot of people and some are pretty emotional. But no one in my close acquaintance has gone so far as to kill."

Now, the people I'm talking to *know* someone who allegedly took this step, or at least they have had to confront the fact that a lot of evidence exists to indicate that the murder occurred. They've come face to face with this mystery, and it's fascinating to see the reaction because it says something, not only about the way they felt about the people involved, but about the way they deal with life.

I've had interviews that take on psychiatric elements. I vividly recall one session that was set up by a five-minute phone call — the first contact I ever had with the guy. I appeared at his office, we shook hands, and he began talking. I asked questions, he responded, and it turned out that his association with the subjects of my book was interwoven with intimate details of his own life. Realizing the relevance of this information to my project, he was consistently candid. Hours later, as I left his office, he made a comment that confirmed what I had been thinking: the interview had been like a therapy session.

Though it is true that those elements are there, I think that the dynamic between me and my sources is something else — more of a collaboration. The tie that binds us together is a shared interest in getting to the bottom of a distressing human mystery. Certainly in this case, the murder of Holly Maddux was a mystery, and it is clear that learning all I can about that mystery is going to result in learning about a lot of other things. If I focus on learning what happened the day that Holly Maddux disappeared — either

If I think that sources are being naive, I warn them of what they're doing. I don't want them to read the book later and think that things were tricked out of them.

her murder by Ira Einhorn, or the frameup that he claims occurred — the search will take me many places. And by that search, I'm going to be able to learn a lot about two important decades in our history, as well as some vivid truths about appearance and reality — how humans operate.

The search cannot be conducted without the help of others. It is a participatory project. Those giving me information are, in effect, my partners in the search.

Of course, the final shape of the book, as well as all the responsibility, rests in my hands. After I get all that information, I have to go through it, discern the patterns, separate the fantasy from the fact and, finally, focus it in a coherent fashion so that it *says something*. If everything else goes well, all those random events that I've been collecting will be put in a single perspective — one that *has meaning*.

I haven't done this with the Einhorn book. Not yet. But I can tell you what I did with my previous book, *Hackers*.

Not long after I began researching the book, computers became a very hot subject. Some people I approached, particularly some of the early unsung pioneers, were very wary of me. They felt that what they had was something special, almost something sacred, and that some outsider, someone who hadn't been there and lived through it, by coming in and presuming to write about it, was unfairly cashing in on the most important thing they had.

Others thought that it might be okay to tell some of it, but not the personal information. They assumed that in the hands of a journalist, the information would be abused. There were also things that embarrassed them.

I thought the personal component was essential, and tried to make them see that. I wanted more than an idea of how they programmed; I wanted to know how they thought, how they behaved, how they saw the world, how they lived their lives. And eventually I was able to take that information and come up with an idea that had been hanging around, but never coherently explained: the Hacker Ethic. I thought it went a long way in explaining what the computer revolution was all about, and it also said something about how some basic human conflicts arise in a technological society.

When the book came out, almost all of my sources came to agree with my approach. But at least one important figure was very unhappy. He felt that the lifestyle he had previously shared with a very few friends had been violated.

I think that fellow's response is the selfish one. I know from the feedback I got from my readers that hearing about early hacker society was not only fascinating to many, but inspiring. Some people were even encouraged to make life changes on the basis of the attitude that I was able to document. I would not have been able to document that attitude without the cooperation — that leap of faith — of my subjects. So while this particular hacker apparently rues the day he was so frank to me, others were very glad that for that day, at least, he was unselfish enough to share.

So with this in mind, I can feel comfortable asking sources to help — or more accurately, for their participation. When I sit down with someone and ask him or her to be candid with me, I know that though the material may be personal or embarrassing to them, the cause is good.

What I may really be arguing is the value of truth over the value of privacy. People have a right to privacy. But I think it is potentially small-minded for people to always invoke that right over what may be the more courageous step of yielding that privacy for a larger goal.

I hope my sources can understand that. The concept is virtually impossible to explain over the phone. When I get a refusal, I do not even attempt to delve into these philosophical matters. Instead, I implore people not to let their negative answer be a final one. I write them, tell them who I am, what I'm trying to do in this project. I do the best I can to convey my belief that my project depends on accuracy, and their participation will assist me in that respect. I tell them that neither of us wants a scenario in which, after the book is published, they find themselves saying, "He missed this aspect — and I could have helped him understand it."

I've been fortunate in winning the cooperation of many who were formerly reluctant to participate. I realize that some will always hold out. One answer that I can accept more easily than a *no* based on privacy is a refusal on the basis that I, personally, have not earned someone's trust. Of course I'll try to present evidence that presumably will show my trustworthiness, but ultimately, a refusal like that is an individual choice I must accept. Still, I hope that these silent witnesses are willing to share their experience, if not with me, at least with *someone*. Privacy is wonderful, but our experiences — good and bad — are capable of enriching others. Why let those experiences die?

Thinking this matter through has helped me pursue this difficult project. But I still procrastinate before contacting people when I know I'll be an unwelcome caller. It's never fun to ask people, especially strangers, to do something difficult. But now I am finally comfortable with the answer to that question, "Why should I talk to you?" And I hope by my account of that process, I've communicated how a nonfiction writer conveys reality. ■

The aim of artificial intelligence is to find a general theory of intelligent behavior wherever it occurs, in systems natural or artificial.

Black-and-white drawing, India ink on paper, 22" x 30", 1986 by Harold Cohen and his computer program, AARON. Mr. Cohen taught AARON how, not what, to draw. Who should hold the copyright?

SCIENCE AND MEANINGS IN ART

BY PAMELA McCORDUCK

IN EARLY 1987, the *New York Times* reported that a forthcoming show at the National Gallery of Art in Washington, D.C., of the Andrew Wyeth "Helga" series of paintings, had sharpened debate on the value of Wyeth's work. But to an outsider, the debate among the credentialed critics was even more interesting. They went at each other (and somewhat incidentally, at Wyeth and his admirers) with a bracing acidity.

The National Gallery's deputy director, art historian John Wilmerding, declared that the museum was mounting the show because, along with Hopper, Wyeth is one of the century's two great American realists, and deserves such attention. But Philippe de Montebello, director of the Metropolitan Museum of Art in New York, disclosed that his museum had turned down a chance to show the series, "quite pointedly and as a conscious decision." Quite pointedly, he declined to elaborate.

Edmund P. Pillsbury, director of the Kimbell Art Museum in Fort Worth, said Wyeth is no artist but a mere illustrator, and not so good at that, being sentimental and backward-looking; Henry Geldzahler, former curator of 20th-century art at the Metropolitan, accused Wyeth of being no more than a regionalist, maybe master of a few conjuring tricks, and accused the National Gallery of pandering with such a show; still another well-known critic, Hilton Kramer, said Wyeth's pictures "enable people who don't like art to fantasize about not living in the 20th century." Finally, Robert Rosenblum, a professor of art history at New York University, managed to insult everyone evenhandedly: Wyeth, he said, is at once the most overestimated painter by the public and the most underestimated painter by the knowing art audience.

Pamela McCorduck presented this paper at a meeting of the Reality Club in The New York Academy of Sciences on March 5, 1987. Pamela, a writer, is the author of Machines Who Think *(W. H. Freeman, 1981),* The Universal Machine *(McGraw-Hill, 1985), and co-author, with Edward A. Feigenbaum, of* The Fifth Generation *(Addison-Wesley, 1983).* —*John Brockman*

A more genteel example of the disarray in which art criticism finds itself just now emerged in February 1987, when the Metropolitan Museum of Art opened a new wing devoted to 20th-century art. The wing was widely described as "the fourth big museum" in New York City devoted solely to the present century, and generally drew praise.

But some dissented. The Metropolitan, said Grace Glueck, writing in the *New York Times*, traditionally has been the home of masterpieces. "Given the impossibility, even by the most astute of curators, to make such judgments about the art of the immediate present, some have argued that the Met take a more distanced role in the current scene, focusing on landmark works and allowing the latest and more speculative ones to — well, shift for themselves."

In other words, not only are masterpieces impossible to recognize immediately (if the word masterpiece still has any meaning at all) but as the controversy about Wyeth shows, critics can't even agree on what's merely good — at least not until sufficient time has passed for a consensus to form. That consensus itself is subject to change: fashions in art seem as fickle as they are in couture.

All this is fun, but it won't do. I think it needn't have to do, at least in the future. With the aid of science, specifically research in artificial intelligence and cognitive psychology, I think a new rigor can be brought to art criticism.

But why should we care? The artists will do whatever they must, as artists always have, and the critics will say whatever they want, their words to die and be exhumed only when historians feel like condescending.

In fact, the issues are deeply important. We humans make symbols compulsively, generating ideas in our heads as quickly and naturally as we generate cells in our bodies. We imbue everything around us with meaning: we see relationships, connections, hierarchies; we compose, de-compose, abstract, synthesize and analyze; we process and represent. We couldn't stop if we wanted to. In this, the visual arts are among our most significant activies.

It's not surprising, then, that we'd like to understand that whole project better. We'd like to know whether the irresistible impulse to assign meaning and value is arbitrary, or whether some universals exist against which we can place work that aspires to art and measure it.

The very heat of critical squabbles suggests that's what critics believe they're engaged in. But the squabbles founder on vagueness; indeed, some critics have taken pride in being unable to say the unsayable; they shrug; it will always be so.

If such a universal code of meaning and value exists, it may very well be unsayable in natural language for the present. But there are other languages: the history of science lends precedent; the unsayable can eventually be said after all, expressed first in an appropriate language (mathematics, for instance; or now, a programming language) and then translated for better or worse into natural language.

How is one to uncover that universal code, something transcending culture and time, a function (very probably) of our biological legacy as human beings? We stand before the symbolic realm — not just the visual arts, but literature and music, and the most prosaic kinds of information too, for that matter — much the way our forebears a century or more ago stood before the biological realm. The sheer variety and profusion of examples throws the search for common underlying structures, for organizing principles, into despair.

And yet quietly, the van Leeuwenhoeks, the Mendels, the Darwins (and Wallaces) of this new realm have been at work. They're to be found doing research in artificial intelligence (AI) and its sibling discipline, cognitive psychology — camouflaged, since artificial intelligence in the popular mind (even the well-educated popular mind) is usually imagined to be the home of robots and thinking machines and other sensational gadgets. But in truth — and to me, more sensational — the aim of artificial intelligence is to find a general theory of intelligent behavior wherever it occurs, in systems natural or artificial. Some qualitative principles have already emerged to set the agenda for quantitative studies, which have been under way for a while.

Cognitive psychology has borrowed from AI and lent to it generously, both in terms of ideas, instruments (the computer) and researchers, but it differs from AI by focusing on human intelligent behavior. Here much work has been done, and theories about human intelligence are beginning to emerge, powerful and satisfying.

For example, John Anderson, a leading cognitive psychologist, has synthesized several decades' research into a coherent, complex and generally satisfying theory of mind. In his 1983 book, *The Architecture of Cognition*, he presents strong evidence for the idea that a single set of general processing principles account for a broad range — probably the entire human range — of cognitive tasks. To say they are a single set is not to say they are simple, or even few. Moreover, his unitary position is not incompatible with the fact that there are distinct, lower-level systems for vision, audition, motor skills, and so on. Only higher-level cognition involves a unitary system. Mark the key phrase, *higher-level cog-*

A bit recklessly, I am betting that at the higher cognitive level, yet to be fully understood, a set of universals are embedded in all human symbolic expression, the visual arts only one aspect of that expression.

nition. That is the domain where we differ from other creatures on the planet, and it is there that art-making and the response to it take place.

Thus these higher-level structures are not to be confused with the visual primitives that give every evidence of being wired in to the brain. Of these, the art historian E. H. Gombrich can report: "In line drawings, the artist has not invented a completely arbitrary language: indeed, he has discovered a stimulus that is the equivalent in some way to the features by which the visual system normally encodes the images of objects in the visual field, and by which it guides purposive action." In other words, any normal person can recognize a drawing of a cat, whether a few lines of a sumi brush, a painstaking engraving, or indeed, a child's scrawl.

But with regard to art, especially since the advent of modernism, this wired-in set of responses is less important. What is more important in the creation and interpretation of art is the higher structures that go beyond mere recognition and toward active understanding. Anderson, and others with somewhat differing scientific models of mind, have been able to express the difference between higher-level cognition and the wired-in subsystems that we share with other animals because the computer, with its hierarchical levels of processing, has provided a splendidly detailed model for making those distinctions and testing hypotheses about them.

Nobody's model of mind is yet complete. Most cognitive psychologists believe the realm of the symbolic is more complex than the physical realm, and expect to be busy for a long time; meanwhile, as I've said, some general principles are emerging. Here I place my bet, that the cognitive psychologists can someday guide us to a more rigorous and, I believe, more satisfying notion of what constitutes the good, even the great, in art.

Here it is that art critics will find grounds for armistice. I am suggesting that at the higher cognitive levels of the human mind, at the level of data structures and processes that are being found to underlie all higher intelligence (mechanisms of dynamic encoding, storage, retrieval, matching, interconnections in a tangled hierarchy — a technical term, signifying the ability for elements of a hierarchy to shift in place and importance leading to great complexity), at that level a universal set of symbolic structures exist with enduring meanings, bound up with our biological legacy but not necessarily bounded by it.

I further think the measure of goodness, even greatness, of a piece of art — visual, literary, or even musical — will be how it connects events in the outside world to a combination of those primitive systems we share with other animals, and those universal symbolic structures that are ours alone. The more of those structures the work engages — the more fully the artifact maps between the interior symbolic structures and the exterior, as a scientist might put it — the greater the artifact.

I also suspect this is what the critics have been struggling to say. Unfortunately, they've not only lacked a precise language in which to phrase it, but the processes and structures I refer to have been hidden away, first in artificial intelligence and then in cognitive psychology.

Let me move from speculation to discuss two germane efforts, quite different from one another, but each growing out of artificial intelligence research and offering new insights into the making of art. One effort addresses the analysis of art, part of the proper work of a critic. The other, however, addresses the creation of art, and in fact is the work of an artist.

Russell Kirsch, a specialist in natural language understanding, and Joan Kirsch, an art historian, have combined some of the formal grammars used successfully in automatic language translation with techniques of a computational field called pattern recognition, to investigate whether a grammar of the visual arts might exist, and if so, whether it can be understood and specified precisely enough that a computer program might produce recognizable art.* ►

* Though automatic translation of natural languages has often been mocked as the most obvious failure of artificial intelligence's overreaching, business and scientific documents are every day quietly, cheaply, and usefully translated by machine in Europe, Japan and, more modestly, the U.S. No single technique has yet shown itself to be the very best approach, but sophisticated projects, relying on new findings in cognitive psychology and, more importantly, driven by the fast feedback computer experiments provide, are making natural language understanding one of the most exciting and fruitful areas of AI research. The Japanese especially have set this as one of their foremost goals.

The idea of such a grammar is not new — I trace it back to Victorian times at least, and its most notable recent advocate is the philosopher Nelson Goodman — but the Kirsches are among the first to try not only to identify the parts of such a grammar, but also, by using the computer, to test their hypotheses in a rigorous and quite concrete way. It's the difference between being able to read a foreign language and being able to speak that language fluently.

As a model to test their hypotheses, the Kirsches have used the Ocean Park Series of paintings by the abstract expressionist, Richard Diebenkorn. Diebenkorn's elegant and serene work lends itself well to this kind of analysis, since the order with which his geometric compositional elements are laid down is hinted at in his finished canvases. And indeed, by treating painting as a symbolic expression whose process can be reproduced, the Kirsches have fashioned "pseudo-Diebenkorns," randomly generated images based on rules that constitute what they believe is Diebenkorn's personal visual grammar. In other words, the Kirsches have been able to specify his language precisely enough to teach the computer to speak "Diebenkornese."

Russell Kirsch says that when he and Joan Kirsch sent the artist one of their first efforts, hoping for helpful criticism to refine their program, they were disappointed by Diebenkorn's laconic reply: *Yes, that's me.* Shortly after, they discovered that the pseudo-Diebenkorn they'd sent him is a near-twin of a recent painting of his they hadn't seen, Ocean Park #126.

The Kirsches have deliberately ignored color and texture for the time being, and even sympathetic art historians caution that other kinds of paintings, such as Rembrandt's, will raise other questions. Moreover, the news from natural language understanding is that grammar without semantics, without attention to meaning or context, is problematical to say the least.

This is a beginning. The Kirsches' work calls attention to powerful tools already extant for analysis and understanding of the fine arts. (It shouldn't be confused with the recent conjecture by the artist Lillian Schwartz, that the Mona Lisa is in fact a self-portrait of Leonardo da Vinci. Her suggestion relies on computational techniques, but her insight is altogether a feat of natural intelligence.)

The Kirsches are among the first to use the computer for this kind of careful analysis, and then synthesis to test and refine their analytical accuracy. But Harold Cohen is surely the first to use the computer to study the art-making process, and thereby to make art.

The 1986 pen-and-ink drawing on the opening spread shows a solitary figure in a tropical forest. He raises his right hand — in peaceful greeting, let's say, or to brush the dense growth away, a tendril twining over his chest, under his arm. Then again, beyond our view, outside the frame, menace: he halts abruptly, hand thrown up in horror. The forest primeval, at least in our imaginations, is paradise, yes; but also unforgiving terror, not all of it animal. That ambiguity is part of the picture's power.

Paradise or hell, this artist has never seen what is only imagined, and has joined in the long tradition, from Cro-Magnon cave walls to Egyptian funerary art to Henri Rousseau, of expressing what *might be;* something as significant to the human imagination as what *is*.

Except the artist is a computer program. Equipped (shall I say endowed?) with ideas about plant growth, about the size and shape of human beings and plausible poses they might take, equipped too with some ideas about art: closure, occlusion, spatial balance, symmetries pleasing and boring — the program goes on its otherwise random and autonomous way, doing pen-and-ink drawings by the thousands. It remembers what it has already done, and won't repeat itself unless explicitly asked.

Its name is AARON — a little joke about Aaron's rod there, I once supposed, but I supposed wrong: AARON was intended to be the first of a series of programs, to be named alphabetically. Instead, AARON has persisted, evolving into greater complexity and maturity. It's also the Hebrew name of Harold Cohen, the artist who created AARON, endowed it with its essence, and who watches, as amazed as anyone, while AARON draws. AARON is artificial intelligence.

This truly raises puzzling questions. To be sure, some of the same questions are also raised by other works of art, questions about the nature and meaning of art itself within a culture and outside it, and about the role of the viewer: how much cultural legacy — training, discernment, and of what type — viewers must bring to appreciate this or any other picture. And suppose viewers can't forget or forgive AARON's genesis. Will they deprecate what they see regardless, dismissing it all as a variation on faking and forgery, with all the issues that raises? For AARON's work also joins a much smaller set of art objects that ask the artist's identity (AARON? Harold Cohen?), a question of interest not only to aestheticians but to legal theorists as well: does AARON hold copyright on its work?

Further questions: AARON is only a semi-intelligent machine (that is, it draws its pictures but doesn't then quarrel with critics, gallery owners, or even Harold Cohen). It has no perceptual apparatus to "see" what it imagines (though we now know what humans perceive is very much a func-

Black-and-white drawing, India ink on paper, 22" x 30", 1986 by Harold Cohen and AARON. Is intelligence all-or-none? AARON draws, but doesn't quarrel with critics, gallery owners or even Harold Cohen.

tion of our internal symbolic structures, shaped by a long acculturation process). Lacking eyes, lacking interests beyond its own drawings, can AARON pretend to intelligence at all? In other words, is intelligence all-or-none? Finally, is this art?

When Cohen, a painter who represented Great Britain at the Venice Biennale in the 1960s, first began his work on AARON, he aimed in general "to understand more about the nature of art-making processes than the making of art itself allows." Under normal circumstances, he goes on, the artist provides a near-perfect example of an obviously present but virtually inaccessible body of knowledge.

How to gain access to that body of knowledge? Cohen began, as many before him, by examining his own art-making. He also examined the art of humans all around him, particularly the earliest, the paleolithic artists. From both these studies, he derived a set of primitives — shapes and rules about those shapes — which he was able to represent in a programming language, and have a computer execute in the form of drawings that spectators could react to.

Cohen was seeking a more precise answer to some important questions. What is an image? How do two-dimensional marks on a surface evoke in the human mind objects in the world? Do certain universals exist within our cognitive structures that permit humans to infer meanings from two-dimensional images? In brief, Cohen has been seeking not only the grammar of two-dimensional images (closed figures standing for solid objects; occlusion standing for the third dimension of spatial relationships) but also the beginnings of their semantics: the minimal conditions for a set of marks to function as an image.

AARON's drawings weren't intended to be aesthetically pleasing, though as it happens, the program makes pleasing drawings. Instead, the program was intended to permit examination of certain im-

"THE first time the program accumulated closed forms into something it knew to be an approximation of a figure, and I found an array of quasi-people staring eyelessly at me from my old Tektronix 4014, I recoiled in fright. What was I getting myself into?"

portant properties of freehand drawing, what Cohen calls, in a deliberately general phrase, "standing-for-ness."

AARON's first images were abstract, sharing with paleolithic art (and perhaps most human image-making) attempts to minimize the problem of dimension, with nothing implied about depth by the spaces between the pictorial elements. The program was then expanded to study edges and implied depth.

Lately, the program has surprised its longtime viewers by doing figurative drawing — something Harold Cohen the painter avoided, but which Harold Cohen the studier of image- and art-making must explore. ("The first time the program accumulated closed forms into something it knew to be an approximation of a figure, and I found an array of quasi-people staring eyelessly at me from my old Tektronix 4014, I recoiled in fright. What was I getting myself into?") These quasi-people are distinctively AARON's: they can be identified by gender, seen to frolic in recognizable, though fantastical, tropical gardens, upon playing fields, or (perhaps in homage to Cezanne) upon bathing beaches. Cohen has not begun to attack the problem of color, but occasionally, for clients and collectors, he hand-colors AARON's drawings.

To repeat, AARON cannot "see" human figures, trees, leaves, playing fields or any other part of the material world. Instead, Cohen has provided his program with *ideas* about these things, expressed in computer code. He has given it indirect knowledge. And in the manner of an artist who must conceptualize what travelers tell him about a faraway place he has never seen (or an artist who illustrates a fairy tale), AARON has taken off, making pictures by some general rules, and yet at random. AARON knows how human joints move and how human figures keep their balance, and so can summon up a nearly infinite repertoire of plausible human poses. When it places those figures within a landscape, the general ideas it has about plant growth allow it to generate widely divergent individual plants and trees. It chooses how the figures will pose and within which landscape they'll appear.

AARON exemplifies a central idea of artificial intelligence: the program is able to generate the illusion of a complete and coherent set of images out of a comparatively simple and sparse lower representation. Reactions from viewers around the world (Japan, Canada, the U.S., Europe) are surprisingly consistent: they engage with the images and speak of qualities of fantasy, lightheartedness and joy in them. (Critics who know Cohen's own painting have claimed to see stylistic similarities between it and AARON's, which, I confess, escape me.*) In short, AARON is a provocative insight into creation in the visual arts.

This is image-making, but is it art? "Yes," Cohen answers serenely, standing aside from his creation, his protege, as he calls it, which busies itself with its drawings.

"Within Western culture," he goes on, "we have always afforded the highest level of responsibility — and praise or blame — to the individual who works on the highest conceptual level. We may hear a hundred different performances of a Beethoven quartet without ever doubting that we were listening to Beethoven. We remember the names of architects, not those of the builders who made their buildings. And, particularly, we value those whose work leaves art in a different state from the state in which they found it.

"Now it seems to me that AARON — the program — stands in relation to the individual drawings the way a Platonic ideal stands to its earthly instantiations. It is a paradigm. The fact that I have found a way to work my will upon, and through, the paradigm, rather than upon its single instantiations, simply means that my level of involvement

*Harold Cohen told *WER* in a phone conversation that he no longer painted — because his paintings began to look "derivative of AARON's."

is a great deal higher, conceptually speaking, than has ever before been possible for the visual artist. It is more like the way a composer writes a score instead of giving a performance, although in my own case the program is responsible for all the performances also, as if a score could play itself. And, of course, that has been the avowed aim of composers throughout this century."

I've suggested that the worth of art lies in how it connects events to the outer world with the higher-level symbolic structures within us, the more of those structures engaged, the better. By that criterion too, Cohen's work is art, an embodiment of some of the most significant ideas of our time.

The visual arts, Cohen argues, are humanity's most varied and subtle exercise in knowledge representation. The history of art is not simply a record of shifts in meaning or shifts in style, but also shifts in the *relationship* of meaning and style, all those smaller by far within a culture than between cultures.

Finally, AARON certainly makes a mess of Nelson Goodman's tidy distinctions between painting, as a one-stage or autographic art, beginning and ending with the artist, and music as a two-stage or allographic art, with a composer and many performers. Ah well.

The Kirsches have written that their hope is someday to be able to rephrase the question, *What does it mean to you?* to say instead, *What does it mean?* In that latter question, and its answers if they exist, lies the burden of my argument.

Cohen, for his part, is dubious about such a code, dismissing it as the "telecommnications model of art": original meanings encoded in an image transmitted by the image's appearance, "noise" in the system circumvented by interpretation. "The encoding and decoding of messages requires access to the same code-book by both the image-maker and the image-reader, and that code-book is precisely what is *not* carried across from one culture to another."

Then what is? The question is open. Cohen suggests the transaction between image-maker and image-reader takes place only at a low and simple level of cognition (the primitives generally recognized as resident in the visual system). Any meaning is generated by the structure of the image rather than by its content. Thus the interpretation I've offered of one of AARON's drawings rests on one individual's lifetime of acculturation and nothing more. Cohen would permit me my duly acculturated interpretations, satisfied that AARON's pictorial generative power had drawn me into a transaction, which is not an image of a man in the forest primeval but rather the pictorial record of an act of

"IN my own case the program is responsible for all the performances, as if a score could play itself."

will — AARON's, and finally, Harold Cohen's. And this accords with a number of prominent aestheticians and philosophers who believe that's nearly all that can confidently be said about any work of art.

Cohen may very well be right to doubt universality in higher representational forms (in the end Freud and Jung were unsuccessful in that search); at the same time he shows us universality at a lower cognitive level, where certain motifs are ubiquitous in human expression — zigzags, crosses, squares, mandalas, combs, etc., all of them built up from even simpler elements.

But I am betting he isn't right. A bit recklessly, I am betting that at the higher cognitive level, yet to be fully understood, a set of universals are embedded in all human symbolic expression, the visual arts only one aspect of that expression.

Artificial intelligence has properly set many ambitious goals for itself: a rigorous understanding of intelligence, wherever it manifests itself; more precise concepts of mind, understanding, learning, knowledge representation, and the uses of natural language. The applications of AI research (which feed back into its science) have still other goals. How impertinent for an outsider to ask for more.

Still, I hope artificial intelligence can also begin to illuminate the universal code, if such a thing exists — a level of meaning, of universal concepts, underlying the most important symbolic expressions of human experience. In AI research, the question has already arisen and begun to be dealt with in studies of linguistic utterances; it arises now in visual representations, and will rise once more in other places. If such a question is to be moved beyond mere rhetoric (a phrase to chill any writer) and answered with deep, objective knowledge, artificial intelligence — of all things — is our best hope. ■

Reality Club

TO COMMUNICATE TRUTH

HOW RESEARCH CORRUPTS TEACHING

"A professor has two functions: (1) to be learned and distribute bibliographical information; (2) to communicate truth. The 1st function is the essential one, officially speaking. The 2nd is the only one I care for. Hitherto I have always felt like a humbug, for I am weak in the first requirement. Now I can live for the second with a free conscience."
—William James to Theodore Flournoy on the occasion of James' retirement as Professor of Philosophy at Harvard University

BY PAGE SMITH

Illustrated by Phil Frank

Page Smith addressed the Reality Club about "What is History" at the conference room of John Brockman Associates on October 8, 1986. Page is an historian, former Provost of Cowell College, University of California, Santa Cruz, and author of A People's History of the United States *(McGraw-Hill; eight volumes).*
—John Brockman

IT MIGHT well be argued that William James was Harvard's greatest teacher. Beginning as a young instructor in anatomy, he became, successively, professor of psychology (and "father" of American psychology) and one of our greatest philosophers. Before his retirement in 1907 he had come to feel that Harvard was far more interested in "learning" in the formal sense (what we will call "knowledge") than in "communicating truth."

Something needs to be said about how the situation that depressed James came to be. It is an appropriate time to do so. We are presently in the midst of one of our periodic and extended critiques of American education, especially higher education. Every decade in the years covering my own academic and post-academic career has witnessed a number of highly publicized studies and reports on the state of undergraduate instruction in American universities. The reports have been monotonously and predictably the same: undergraduate students are being short-changed by their professors in favor of something called "research." The remedies for the neglect of the teaching function, we are told, are recognition of superior teaching in the form of prizes and rewards — teacher of the year, etc. Over the years, all these exhortations to a stronger commitment to teaching have had the same result: Zip. Zero. The dissatisfaction of students, indeed the unhappiness of students with the quality of the teaching they receive, is a phenomenon that has been noted at least since the beginning of the medieval university.

The fault now lies at the door of faculty members indifferent to the needs of their students. I have heard more than one colleague declare that the emotional problems of his students were none of his concern. Whose then? Well, of course, the professionals: the psychologists and the counselors.

Interestingly enough, none of these voluminous reports, so far as I am aware, has undertaken to examine in any sustained and serious way the real villain of the piece: research. Research, it is simply assumed, must go on apace (those unhappy individuals who don't do it are terminated) because "research is the primary function of a great university," etc.

But is it? Or if it is, should it be? The fact is that research is not something to be balanced against teaching as an equal or superior good, as an urgent social or intellectual necessity. As long as that notion prevails, it will be impossible to substantially improve the deplorable level of undergraduate instruction. The vast majority of what passes for research in American institutions of higher learning does not deserve the time and paper expended on it. It is not a scientific enterprise resulting in greater and greater refinements of the truth. For the most part it is rather low-level academic activity

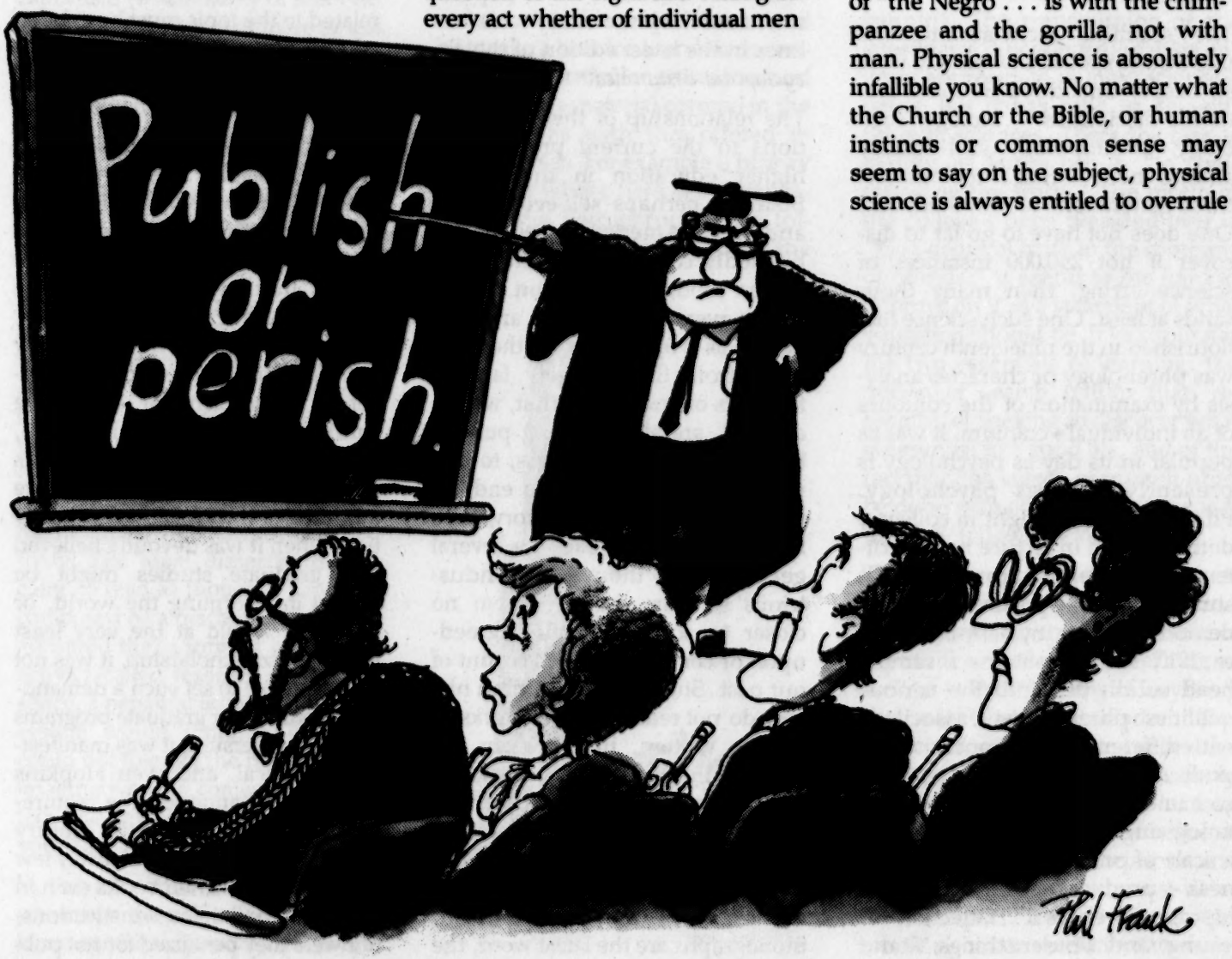
that does not result either in greater knowledge or greater good but rather in larger and larger piles of monographs.

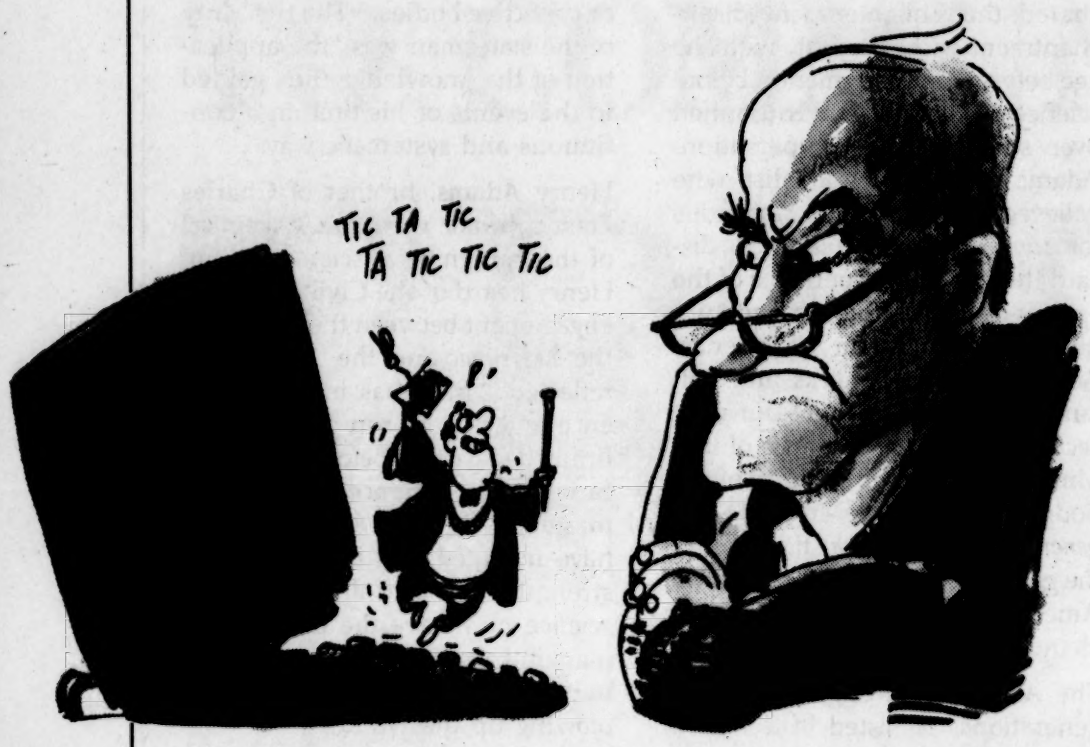
An historical perspective may help to unmask the pretentions of research and the attendant fallacies that so compromise higher education. The argument of what constitutes a genuine education is, of course, older than the Republic, but for our purposes it can be taken to begin with Thomas Jefferson and John Adams. In their famous correspondence, Jefferson chided Adams for stating that it was the responsibility of an educational system to transmit "a steady adherence to the principles, practices and institutions of our fathers" as "the consummation of wisdom and acme of excellence beyond which the human mind could never advance." Jefferson was incredulous at such archaic sentiments. Surely Adams had been misquoted. Any enlightened spirit knew that the task of an institution of learning was to transmit the latest scientific discoveries. The Virginian shared the Enlightenment disenchantment with the past, with the age before "enlightenment," before science and reason had triumphed over sentiment and superstition. Adams was a traditionalist who believed that it would be disastrous for any educational system to discard the common experience of the species over time. To his friend's unqualified enthusiasm for science, Adams replied, "Checks and Ballances, Jefferson . . . are our only security, for the progress of the Mind, as well as the Security of the Body." Adams believed that "the *general principles* of Christianity; and the general Principles of English and American Liberty" must be central elements in any proper education.

The Adamses, through successive generations, persisted in a skeptical view of the claims of science. Charles Francis Adams, Senior, the grandson of John Adams, wrote to *his* son that the end of education was to inculcate "the mastery of the whole theory of morals which makes the foundation of all human society; the great and everlasting question of the right and wrong of every act whether of individual men or collective bodies." The first duty of the statesman was "the application of the knowledge thus gained to the events of his time in a continuous and systematic way."

Henry Adams, brother of Charles Francis, Junior, was equally skeptical of the benignity of science. When Henry heard of the Civil War naval engagement between the ironclads, the *Merrimac* and the *Monitor,* he reflected, "Man has mounted science and is now run away with. I firmly believe that before many centuries more, science will be the master of man. The engines he will have invented will be beyond his strength to control. Some day science may have the existence of mankind in its power, and the human race will commit suicide by blowing up the world."

Henry Adams' contemporary, George Templeton Strong, the brilliant diarist, had a somewhat different critique of science. The latest scientific "discoveries" had a disconcerting way of turning out, before long, to be wrong. Science, Strong noted, was declaring that the place of "the Negro . . . is with the chimpanzee and the gorilla, not with man. Physical science is absolutely infallible you know. No matter what the Church or the Bible, or human instincts or common sense may seem to say on the subject, physical science is always entitled to overrule





them. It is very true that the science of 1863 has revised or modified about 250,000 of the decisions it gave twenty years ago, but that makes no difference."

The "scientific" racist assumptions that Strong specifically refers to were so deeply imbedded in some academic disciplines — biology, sociology, anthropology and history among them — that it took almost three generations to root them out. One does not have to go far to discover if not 250,000 instances of science erring, then many thousands at least. One such science that flourished in the nineteenth century was phrenology or character analysis by examination of the contours of an individual's cranium. It was as popular in its day as psychology is presently; it *was* psychology. Phrenology was taught in colleges, demonstrated in lecture halls, written about in learned tomes. That it survived into the present century is demonstrated by my baby-book, circa 1910, which contains a sample head subdivided into the various qualities phrenologists associated with different protuberances on the skull. Apparently when I was ten or so I undertook a little home phrenologizing. I rated myself high (on a scale of one to ten) on "Amativeness — produces sexual love," "Philoprogenitiveness . . . affection for young and tender things," and "Benevolence." Phrenology had, in addition, a dietary dimension: no tobacco, no liquor, vegetables preferred and lots of exercise. What may well have been the most popular science of the last century rates four lines in the latest edition of the *Encyclopedia Britannica.*

The relationship of these speculations to the current problems of higher education in the United States is perhaps self-evident. By and large Americans are wholeheartedly committed to the Jeffersonian model of education. In virtually every disciplinary area the emphasis is on science, on the latest news from those largely fanciful frontiers of knowledge that, we are assured, are always being pushed back but seldom, it seems, to any useful or comprehensible end. In my field of American history, they have been pushed back for several generations by thousands of industrious scholars, but we seem no closer to some generally agreed-upon or comprehensible account of our past. Students of American history do not read the great works of history written, in the main, by nineteenth-century historians. Instead they read monographs, narrowly focused, specialized studies by historical investigators. Why monographs instead of the admitted classics? Well, as we have noted, monographs are the latest word, the newest "scientific" experiment. They are tangible proof of research and are valued, by and large, according to the ostensible research that has gone into them. "A work of enormous research," the approving reviewer notes. "Ten years of intensive research has gone into this definitive work," etc.

There is, of course, nothing inherently wrong with research. In certain fields, in the sciences particularly, it is essential. It is rather the *character* of the research that goes on in the modern university that is at issue. Loosely defined, research is any inquiry directed toward discovering a particular fact or congeries of facts. We speak of doing some research to discover the best purveyor of fresh fish or the vineyard producing the best inexpensive table wine. Modern science demands a high degree of specialization. Academic research, whether in the "hard" physical sciences or the "soft" social sciences, is the child of specialization. To be respectable, academic research must be directed at a topic that can be examined in exhaustive detail. Everything remotely related to the topic must be exhumed and integrated into the dissertation, and eventually, if one is not to be terminated, into a book.

Research is one thing; publication is another. It is only relatively recently that the two have been joined in unholy matrimony and elevated to reigning deities of the academic world. In the early years of the modern academic dispensation, years that corresponded roughly with the rise of Johns Hopkins University as the exemplar of graduate studies on the Germanic model, publication of the dissertation was required as a condition for the awarding of the Ph.D. At that heady time when it was devoutly believed that graduate studies might be crucial in reforming the world, or that they would at the very least revolutionize scholarship, it was not unreasonable to set such a demanding standard. For graduate programs in most universities it was manifestly impractical, and even Hopkins eventually abandoned the requirement. From the turn of the century to the end of the 1930s, relatively few professors published books even in the most prestigious institutions, nor were they penalized for not pub-

lishing. But in the aftermath of World War II, the requirement of publication was revived, not this time for doctoral dissertations but for retention and promotion of faculty. In the vast expansion of the American academic world after the war, and the merciless competition between universities for research grants and public monies that followed, the number of published scholars whose names decorated the catalog of a university was taken by various granting agencies as the ultimate measure of that university's distinction and, in direct consequence, of the number and size of the grants it received. Only the naive would believe that this war for prestige was carried on in the name of the disinterested pursuit of truth or with any concern for the needs of undergraduate students who made up by far the greater portion of all university enrollments.

Most faculty members unreflectively committed to the research-resulting-in-publication syndrome would resist the notion that the system is in fact a by-product of industrial capitalism (which many of them deplore) but the notion of more or less interchangeable professors writing more or less interchangeable books could only have come out of a society in which efficient production was the highest national goal, indeed, a society one of whose most spectacular achievements was the invention of interchangeable parts.

A high degree of specialization had to precede the modern canon of research-resulting-in-publication in order for a predictable product to be required. Such books must be impersonal and colorless, lacking any elements of style. They must also be free of "value judgements" that might impair their scrupulous objectivity. The ideal dissertation thus came to read as though it had been composed by a machine. If you once admitted that a form of intellectual activity called research was, in essence, a personal activity, the whole system would totter. The system could not tolerate the personal, the imaginative, the conjectural, or, in fact, the general as opposed to the specialized.

In the atmosphere of the modern university, the deification of research has meant that research has become a kind of free-floating, self-confirming activity with little if any relationship to undergraduate teaching and only the most casual, or, one is tempted to say, coincidental relationship to true scholarship. It is a classic instance of the means becoming the end. The doing of research has become more important than the result since people's careers depend on it. The means, primarily that of recording information on little cards, carefully filed away, is, in effect, a ritual that reassures the researchers that they are engaged in meaningful professional activity.

Defenders of research as the primary activity of university professors are disposed to argue that research is essential if a professor is to "keep up with his field," remain "intellectually alive," etc., thereby directly affecting his teaching. But this notion simply will not hold water, as far as undergraduate instruction is concerned. The fact is that the highly specialized research of most professors has very little relationship to what their students need to know or even to the specialized courses they teach. The surest test of this proposition would be to take a hundred random monographs by particular professors and compare the material covered in the monographs with that offered in their courses. For example a history professor whose field of specialization is the Reconstruction era following the Civil War may spend the better part of his academic life researching voting practices in the state of Georgia in the period between 1865 and 1875. To maintain that such research, which is given a clear priority over teaching, serves a useful instructional purpose is to stretch credulity beyond reasonable limits. Indeed, it can never be stated too often or too emphatically: *the great majority of modern academic research is not complementary to the teaching function; it is antithetical to it*. Genuine research is going to go on with little or no encouragement because the answers to certain questions will continue to fascinate and obsess some otherwise normal people. Such labors are clearly labors of love and these labors are, in practical fact, the only labors worth doing. Research undertaken as a requirement for promotion is fatally compromised from the beginning.

The misguided infatuation with research-resulting-in-publication has not simply taken up professorial time that had been more appropriately been spent in teaching undergraduate students, it has obscured the very nature of teaching and learning. The transmission of the latest news (knowledge) may be entirely appropriate in most scientific fields, but it has little to do with the non sciences. There the task is plainly, as James put it, "to communicate the truth." The motto of the college I once presided over is "the pursuit of truth in the company of friends." It seems to me hard to improve on it as a statement of what education should be. It incorporates the two essentials of learning: the notion of search (rather than research), of seeking to discover what is essential to a good life, and of the fact that this search or pursuit must be done with others, mentors, coadjutators, fellow speakers.

The notion of the transmission of knowledge as the purpose of education is hostile to the involvement of the student in the act of learning as well as to the teaching of anything that might be called wisdom. The organization of what passes for knowledge in the modern academy is highly intimidating to the learner. The system denigrates the value of the student's own perceptions and intuitions. The student must defer to the expert. It is as though the whole elaborate machinery were de-

signed to overawe. The student is perceived as a passive listener. The physical arrangements of the classroom proclaim that fact.

The enormous and constantly growing cost of higher education is directly the consequence of the research industry. It is in the name of research that professors have bargained their "teaching load" down to a minimum number of hours each week. At Harvard and the University of California, for example, the teaching load is typically two courses each quarter or semester, which generally translates into six to nine "contact hours," the hours spent in a classroom with students each week. Conor Cruise O'Brien has pointed out that the professors with the most formidable reputation as scholars teach the least. The less teaching, the higher the status. O'Brien calls this academic epitome AMT, Attainment of Minimum Teaching.

The other heavy charge imposed by the research-resulting-in-publication syndrome is the heavily subsidized publication, almost exclusively by university presses, of the results of all that research. Suffice it to say that the cost is not justified by the results.

Given generous vacations and frequent sabbaticals (as a relief from the onerous burden of teaching at all), what does the average professor purport to do with these considerable increments of time? Research, of course. It should be said at once that many, if not most, professors are quite dutiful and do in fact spend substantial portions of their time not teaching doing research. Indeed they hardly dare do otherwise, for most of them are continually struggling or straggling up the promotional ladder.

Since research is so thoroughly institutionalized, the question is bound to arise: Suppose, by some miracle of persuasion, universities (who or what are they? Trustees and regents, presidents, faculties?) were to concede that research-resulting-in-publication had become a monster devouring the academy. What would professors no longer required to churn out monographs do with themselves? Well, how about much more time with students, teaching small groups and seminars instead of large classes full of passive listeners? Sounds good but there's a rub. Since the professor is an authority on a rather modest subject, say the New Deal or Third World Woman Poets, how can he or she be expected to teach, say, the role of religion in various cultures? Or a survey of American history? Hasn't the instructor, by virtue of specialization, been spoiled for more venturesome teaching? Only if the instructor moves beyond the fortress of specialization to meet students on the ground of a common zest for discovery, only if the teacher is willing to abandon, at least for a time, a stance as *the* authority on something or other, can he or she join with students as friends in the *pursuit* of truth.

Pursuing truth with students about something as modest and commonplace as the chicken can be a rewarding experience. When, as a professor of history, I undertook such an enterprise with a colleague from biology and a group of slightly bewildered students, we discovered the pleasure of discovery. None of us were experts on the chicken and that indeed was the point. But we all learned a good deal together. Since everyone in the class concentrated on some aspect of the chicken, the instructors learned at least as much as the students. The so-called Chicken Course, scandalous as it was to my colleagues, became for me a model of what a substantial portion of teaching might be. Seen in this light, teaching becomes not the routine transmission of the latest news in the form of scientific knowledge to essentially passive receptors, but what it has always been at its best, a voyage of discovery.

The deflation of research solves only one-half the problem, albeit the more difficult part because of the vested interest of professors in maintaining a system that authenticates them. The second and equally important task is to replace the notion of the transmission of knowledge with the notion of the pursuit of truth; the transmission of knowledge and the pursuit of truth are not necessarily antithetical notions. In the pursuit of truth teacher and students should be constantly alert to new insights and genuine advances in knowledge. Broadly understood, knowledge is much more than the latest academic news, the most recent bulletin from library or laboratory. It includes a storehouse of information, much of it indispensable. The modern academy seldom engages the great themes of ordinary life — faith, passion, love, loyalty, community, sacrifice, heroism, life and death. In that task we need to have access to wisdom, to the collective experience of the race. It was of such wisdom that John Jay Chapman was speaking when he wrote

in 1913 that the emotions of youth in every vital society should be fed with "songs, aspirations, stories, prayers, reverences for humanity, knowledge of God — or else some terrible barrenness will set in and paralyse the intellect of the race. . . . To cut loose, to cast away, to destroy seems to be our impulse. We do not want the past." That is the past that successive generations of Adamses believed contained essential truths that we dare not ignore.

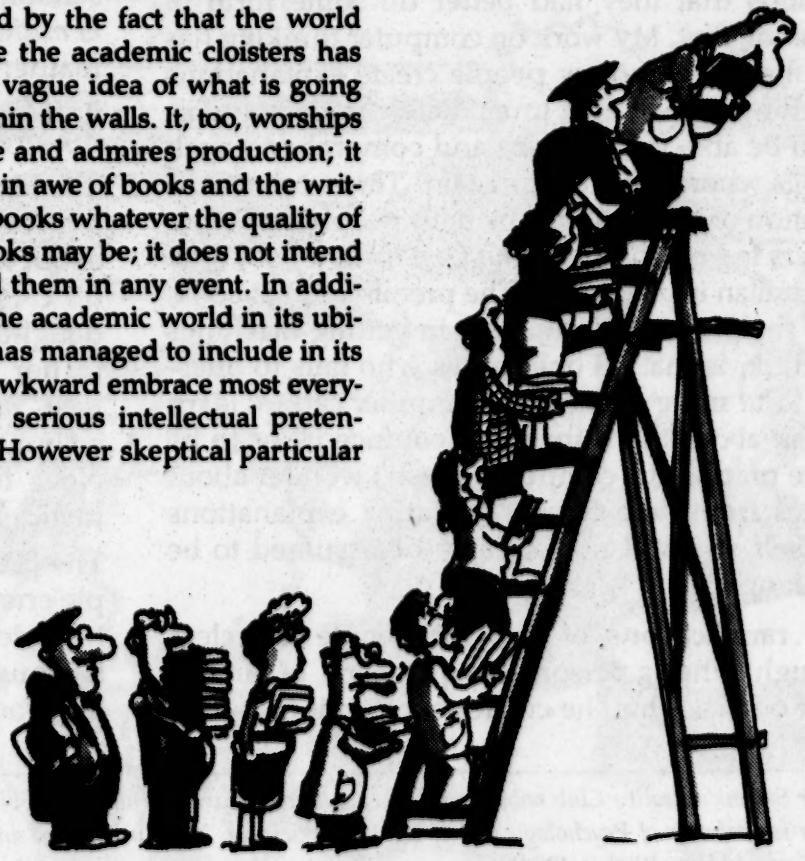
There is one more problem to which we must address ourselves. Education is now organized by "disciplines" or "fields." These are the tireless and unyielding guardians of the status quo, of research-resulting-in-publication, of education as the transmission of knowledge. They are imposed on the student as "majors." Students must have majors whether or not their interests or temperament fall within the boundaries of an established major. But disciplines and their attendant majors do not correspond to any natural order in the universe. They are in fact highly arbitrary ways of organizing and formalizing knowledge. To believe otherwise is to assume that all significant human knowledge was, at some time in the past century, organized into a series of divisions with such names as economics, history, political science, sociology, psychology, anthropology, etc. Is anyone prepared to argue for a moment that any of us would be any the worse off if all the accepted academic disciplines (the hard sciences perhaps excepted) were expunged from university catalogs and replaced by subject groupings with different names? In reordering the curriculum, wouldn't it make more sense to start from specific topics and problems and argue back to courses designed to cast light on them? Shouldn't traditional disciplines be subject to a "sunset" rule that would allow them no more than ten or twenty years of academic existence before they were required to justify themselves anew?

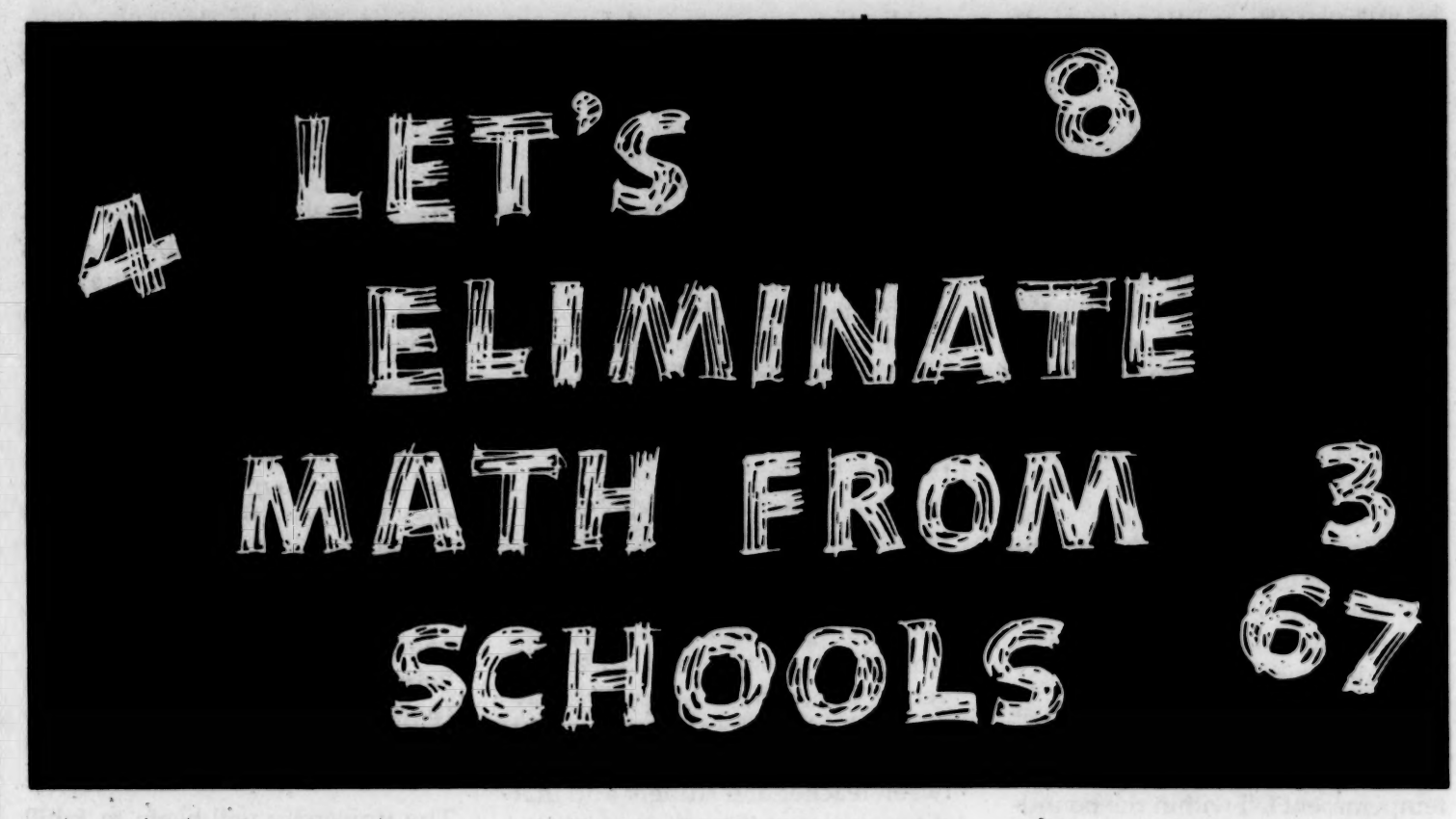
To review. The origins of the veneration of research are reasonably clear. They lie in the worship of science and the desire of all so-called disciplines to be scientific, whether in the study of Dante's *Divine Comedy* or the plight of the urban poor. After World War II, research-resulting-in-publication was required for purposes which had little or nothing to do with the classic teaching mission of the university. Research, in addition to minimizing the role of teaching, freed the professor from any responsibility for the general moral and intellectual development of his students. His responsibility was discharged when he conveyed to them an agreed-upon quota of the most up-to-date information. Gradually any license was allowed him, since it was old-fashioned to think that he had an obligation to be a guide and model to his students in matters of morals or ethics. Chapman noted that "it was impossible not to be morally elevated by the smallest contact with William James." The sentence is worth lingering over. One is tempted to say that such moral elevation is the most precious fruit of the relationship between teacher and student and that *it can only come through personal contact*. No formal relationship can convey it. Without it education in even the most illustrious institution is a tissue of dead works.

All exhortations to professors to be nicer to their students will be unavailing. The problems are, as they say, structural. They are inherent in the system. Moreover, any criticism brings a closing of the ranks amid cries of anti-intellectualism. The problem of substantive reform is complicated by the fact that the world outside the academic cloisters has only a vague idea of what is going on within the walls. It, too, worships science and admires production; it stands in awe of books and the writers of books whatever the quality of the books may be; it does not intend to read them in any event. In addition, the academic world in its ubiquity has managed to include in its often awkward embrace most everyone of serious intellectual pretensions. However skeptical particular professors may be about the claims of the university, they, for the most part, suppress their misgivings, not unmindful of the agreeable perquisites that come with a professorship in a well-known university. The result is that it is difficult to find a platform from which to launch a serious and sustained critique of the practices of the university. Or a fulcrum to budge its stubborn archaism.

Before the teaching of undergraduate students in American universities can be substantially improved, we need (1) to make a clear distinction between the transmission of knowledge and the pursuit of truth; (2) to reduce research to such modest proportions that it does not compete with teaching for a professor's attention; and (3) to accept the fact that all genuine learning involves personal contact between a teacher and a particular student.

The university will begin to fulfill its considerable promise and justify the enormous sums of money it demands from its students, their parents and the taxpayers when it abandons its research-resulting-in-publication obsession and turns its attention to the pursuit of truth in the company of friends. It should strive for intellectual and moral distinction above all else. Research, you may be sure, will take care of itself. ■





BY ROGER SCHANK

I HAVE BEEN WORRYING A GREAT DEAL about education these days, partially because my Artificial Intelligence [AI] work on getting computers to learn has led me in that direction, and partially because I have two rather bright children who seem to find school to be a trial. In addressing the problem of how computers might learn, it is obvious that they had better do some form of thinking first. My work on computer thinking has led me to study how people create explanations for things they do not immediately understand so as to be able to recognize and comprehend such things when they appear again. This work on the creation of explanations by both people and computers led me to write *Any Questions*, a book that Macmillan is publishing. The premise of that book, and the premise of my work in getting machines to think, is that no one thinks who fails to question. Put more simply, if a computer cannot learn to ask about the things that confuse it, or to be more precise, if a computer doesn't wonder about things from time to time, creating explanations to itself, it could not possibly be assumed to be thinking.

The ramifications of this for people are clear enough: when a person asks questions, of himself or of others, when he creates explanations, when he wonders about things and tries to figure out what is going on, that is when he learns best and thinks the most creatively. Children do all this quite naturally enough. You don't need to teach a two-year-old to wonder, and to ask, but adults sometimes forget how. They want to know the answers, and they tend to care less and less for generating and speculating upon the questions.

Why might this be? I am beginning to believe that something very awful is happening to children in school. One of the awful things that is happening is *mathematics*. My claim is that one shouldn't teach mathematics in school. Now I realize that this is a crazy remark, even for me, but crazy remarks are the predecessors of good ideas.

The ideas behind this remark have been percolating for some time, but I really started thinking about them after having finished writing the book on creativity, and then having to both help my daughter with her algebra homework and to talk to her teacher about why she wasn't doing so well. So, I asked myself the obvious question: exactly why does one study mathematics anyway? Now, here I mean mathematics, and not arithmetic. I know why one studies arithmetic.

The premise of school, as far as I can see, is simple enough. Children have to learn certain things in order to function in the world. It is advantageous to be able to read and so we teach reading. You might get the wrong change, etc., and so

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Roger Schank's Reality Club subject was "Explanation, Learning, and Creativity," a talk given in my living room on May 28, 1985. Roger is Professor of Psychology and of Computer Science, Yale University, and coauthor of The Cognitive Computer *(with Peter Childers; Addison-Wesley, 1984).*

—John Brockman

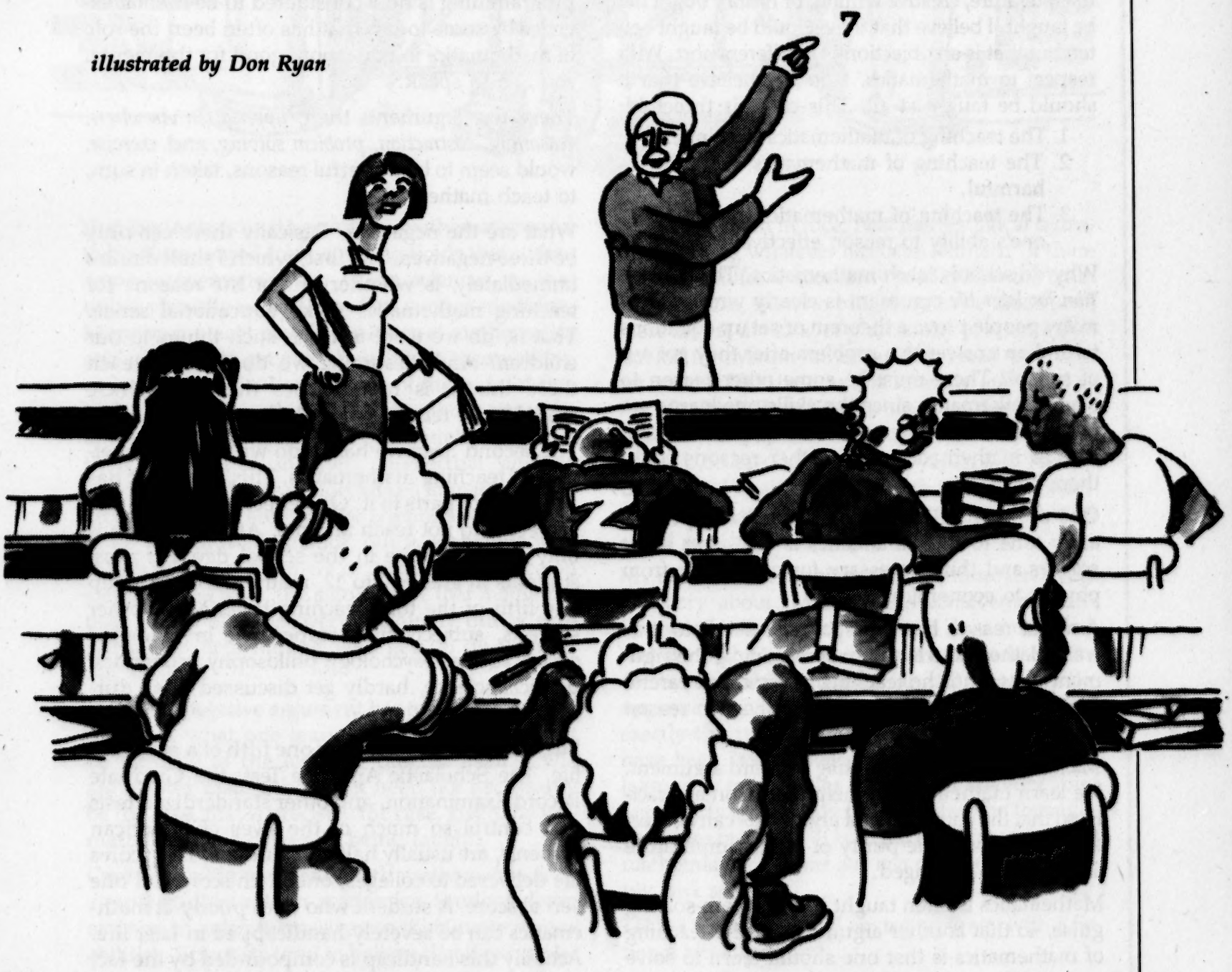
we teach arithmetic. The concept of reading, writing and arithmetic is, essentially, a *let's get 'em prepared to cope* philosophy of education. Of course, school serves more purposes than preparation for coping. There is the obvious *get them off the streets and give their parents a rest* point to school as well as the *let's socialize the tykes so that they can learn to get along with one another* point to education. But, with the exception of these social purposes, the subject-matter-related purpose is at a minimum, one of giving children basic preparation for the real world.

Naturally, if that were really true, it would be possible to end school in the third grade. Children such as I was, and I assume you were, probably would be a lot better off if school *were* ended in the third grade. (All I remember about third grade was my mother, upon being called up to see the teacher, asking her to consider teaching me to sweep the floor so that I wouldn't hear the questions and keep annoying the teacher with all the answers.) Nevertheless, for the other two reasons above, it seems fairly unlikely that schools will be closed any time soon. So, it remains to think about what they should teach after the basics are down.

The schools' answer to this question seems to be to attempt to simulate scholarship as it was known in some previous century. If, to be educated in the nineteenth century meant having to read certain books and attempting to prove certain theorems, and being able to discuss events in world history, then, *by God, let's teach the little buggers that.*

I have lots of objections to teaching the literature of the nineteenth century as much more than historical artifact. I stopped reading on my own for five years after being forced to read *The Rime of the Ancient Mariner, Lord Jim, The Red Badge of Courage,* and *David Copperfield.* (Ironically, I now really like Dickens.) I also have many objections to how world history is taught, given the political philosophy

illustrated by Don Ryan



MANY VERY SMART PEOPLE ARE LOUSY AT MATHEMATICS AND NEVER QUITE GET OVER THEIR FAILURE AT SOMETHING SO IMPORTANT

that always underlies the teaching of it in any school system that tends to disallow any dissent.

However, my objections to the above subjects are small in comparison to my objections regarding the teaching of mathematics. First, I don't complain that literature, creative writing, or history ought not be taught. I believe that they should be taught better, but that is an objection of a different sort. With respect to mathematics, I do not believe that it should be taught at all. This claim is threefold:

1. The teaching of mathematics is pointless.
2. The teaching of mathematics is socially harmful.
3. The teaching of mathematics impairs one's ability to reason effectively.

Why do schools teach mathematics? The *preparation for later life* argument is clearly wrong. How many people prove a theorem or set up equations to find an answer to a problem after they get out of school? There must be some other reason to teach mathematics since the skills one learns are inapplicable for 99 percent of the population that studies mathematics. What other reasons could there be?

One of the more standard reasons has a preparatory tone to it. Mathematics is the *queen of the sciences* and thus necessary for everything from physics to economics.

Another reason has a preparatory sense to it as well. Mathematics is a form of reasoning, the argument goes, and the teaching of logic and careful proof are very useful in learning how to reason effectively in real life.

Mathematics as abstract thinking is a third argument. We learn mathematics to help us reason abstractly, so that the subjectivity of arguments can be erased, leaving only the purity of logical implicature and such to be judged.

Mathematics is often taught in a problem-solving guise, so that another argument for the teaching of mathematics is that one should learn to solve problems, and mathematics is an abstract form of problem solving.

We also frequently hear the *mathematics as mental exercise* argument. Just as Latin was considered exercise for the mind in its time, and as computer programming is now considered to be mental exercise by some today, that has often been the role of mathematics in education, good for the mental soul, so to speak.

These five arguments then, *application elsewhere, reasoning, abstraction, problem solving,* and *exercise,* would seem to be powerful reasons, taken in sum, to teach mathematics.

What are the negatives? Basically there can only be three negatives. The first, which I shall discuss immediately, is whether or not the reasons for teaching mathematics make educational sense. That is, do we want to teach such things to our children? And, assuming we do want to teach these things, is mathematics the best vehicle available for teaching them?

The second negative has to do with the social effects of teaching mathematics. This argument has a number of parts to it. One effect of teaching any subject is to not teach another. After all, there is only so much time in the school day. For most students in grades 7 to 12, mathematics takes up one fifth of the total teaching time. Many other subjects, subjects fully respectable in academic circles, such as psychology, philosophy, economics, political science, hardly get discussed at all during those years.

But, mathematics is hardly one fifth of a student's life. The Scholastic Aptitude Test, the Graduate Record Examination, and other standardized tests that control so much of the lives of American students, are usually half mathematics. Two scores are delivered to colleges, one math score and one verbal score. A student who does poorly at mathematics can be severely handicapped in later life. Actually this handicap is compounded by the fact

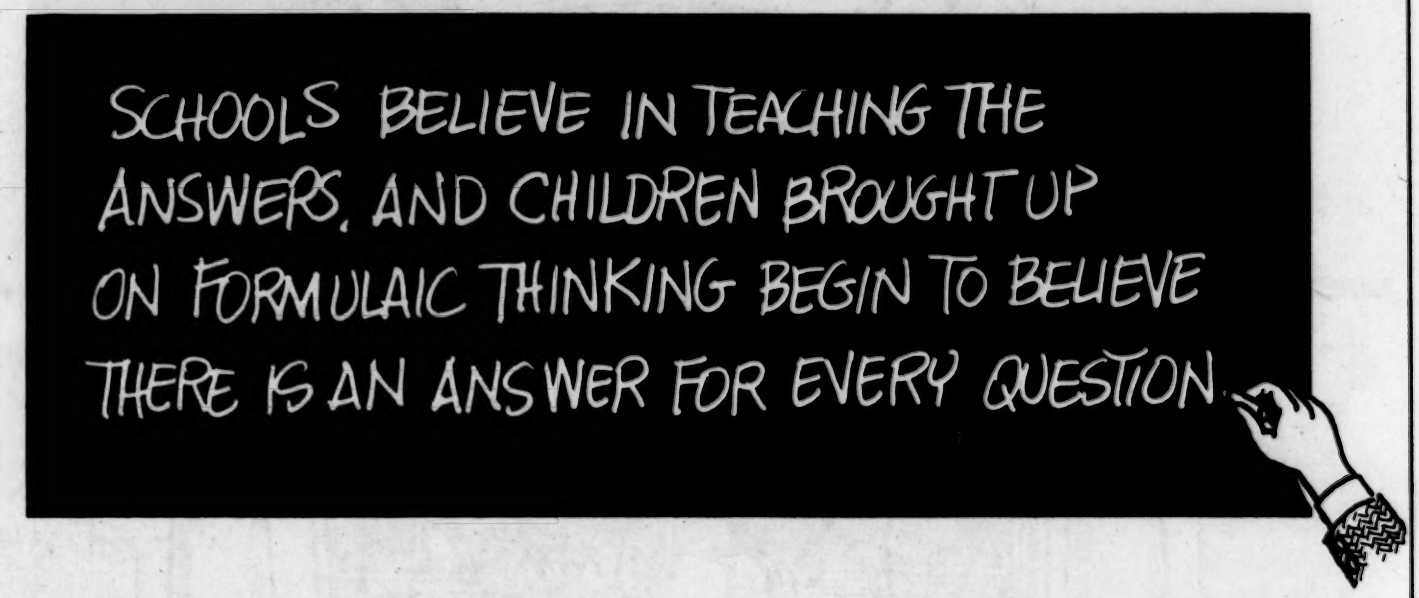
that students who do poorly in mathematics tend to be discouraged from entering fields that utilize some mathematics such as the sciences, or that utilize virtually no mathematics, such as medicine. Many very smart people are lousy at mathematics and never quite get over their failure at something so important. No, I wasn't one of them. I did fine in high school math, but my daughter, my wife, and my mother, who are all quite bright, have had their confidence in their intellectual abilities shaken by mediocre performances in mathematics. Of course, there are very few scientists who haven't done well in mathematics, but it is obvious why that is the case. In an era of increased reliance on standardized tests, the significance that mathematical ability plays is overwhelmingly out of proportion in determining who gets to do what in our society.

The third negative argument has to do with whether or not what one learns in mathematics might be harmful to the learning process itself. I will argue later that, although it need not necessarily be the case, that is precisely the case, given the way mathematics is currently being taught.

One of the big problems with mathematics is its almost godlike role in academics. Students learn early on to judge themselves on their mathematical abilities. Scientists tend to believe that if principles cannot be stated in nice, neat mathematical terms, then nothing whatever has been learned. "If there are no formulas to accurately predict how the brain will function, then no progress can be made until there are" is the kind of philosophy of science that can kill innovation rather quickly. I read with horror articles like the one that recently appeared in the *New York Times* citing a study of the National Academy of Sciences that mathematics education in the U.S. lags behind that of Japan and France. Omigosh. We all gasp and rush to convene committees to deal with the problem. Should we be afraid of a *mathematics gap?*

My claim is that nothing could be more irrelevant to worry about. Mathematics achievement isn't necessarily all that important. It does not follow that an inability to do geometry necessarily indicates an inability to think. In fact, precisely the opposite might be the case. A great ability to follow exactly the rules of mathematical reasoning you have been taught may mean only that you have learned to follow rules well. There are very good arguments to be made that learning the formulas decreases creativity. It is all too easy to assume that mathematics is a *sine qua non* of thinking. It simply isn't so.

Let me illustrate what I am trying to say with a fictional situation:



A young student sitting in math class has been daydreaming instead of paying attention, and hasn't been following the lesson on the Pythagorean theorem. Two other children in the class have been listening carefully to everything the teacher says. When the teacher asks the class to find the length of the base of a right triangle with sides of 3 and 4, one child makes some calculations and then raises a hand to give the answer. The second child thinks for a second and recalls the answer. The third draws a triangle and is ready to make a guess.

The first student knows the formula, namely $a^2 + b^2 = c^2$ (etc.). The second knows the answer is 5 because he has been paying attention to what has been going on in class. The third takes out a pencil and carefully draws a right angle with one side slightly bigger than the other, sees that the hypotenuse has to be slightly bigger than either side, and, guessing that the answer has to be an integer, also comes up with an answer of 5. Which of these students is right? Or to rephrase the question in three distinct ways:

Which of these students will do best in school?
Which of these students will do best in life?
Which of these students is most likely to be the most creative?

My claim is that the teaching of formulaic thinking can have disastrous effects. Schools believe in teaching the answers, and children brought up on formulaic thinking begin to believe that there is an answer for every question.

What we really need to learn is the ability to make the right generalization. We want to help the child see that there is a formula to be invented, rather than a formula to be learned. We want him to notice the paradigmatic case and wonder about why that happens to be the case. Or else we want him to fail to see the paradigmatic case and try to invent it himself. Nothing stifles creative thought as well as knowing the answer.

I believe that the single most important element in learning is failure. But the kind of failure one experiences while learning mathematics tends to be exactly the type of failure that is of little use in learning. I am interested in expectation failure, because when one's expectations have failed is when one starts to look for an explanation, and it is in the construction of explanations that serious thinking begins. But, in mathematics, these explanations are supplied by the teacher. The failures are mistakes in formula application rather than failure to find one's expectations satisfied. Mathematics teaching is arranged so that it is difficult to fail in an interesting way. The end result of this is that learning mathematics teaches you to blindly accept formulas and failing at mathematics teaches you to have an even higher regard for the formulas. In this way, it is easy to see that mathematics can be quite harmful.

The idea is to teach reasoning, not mathematics. In real life arguments are never as clear-cut as they are in mathematics. It is very unlikely that the knowledge needed to construct a good mathematical proof or argument will be transferable to the realm of everyday life. Logical reasoning in the layman's sense of the terms bears very little relation to logical reasoning in the mathematical sense of the term. That this is so is confirmed every time a computer programmer writes a program that fails to work on the first try. There may be nothing wrong with his *logic* in the layman's sense, but plenty wrong in his logic in the mathematical sense.

I believe that reasoning should be taught in school. I also believe that everyday reasoning would best be taught by computer, but that is another subject. However, this subject ought to be taught as a subject in its own right, with relationship to the areas of reasoning that most people must deal with on an everyday basis. Let's teach reasoning in matters of everyday economics or government rather than reasoning about triangles. ■

The Indian Rope Trick

THE CULTURAL CREATION OF REALITY

BY RICHARD RABKIN, M.D.

ACCORDING TO the Copenhagen School of Quantum Physics, when an experiment is set up, there are various tendencies for events to happen. When we make an observation, we "interfere" with the development or building up of these probabilities which "collapse" into one actual event. Until then there are no things, no photons for example. There are only probabilities, so-called "Schrodinger wave functions," until an observation is made. Instead of saying that our apparatus "demonstrates" a photon at this time, we can say that our apparatus "photons." From a quantum-physics point of view, the world is not solid, real, independent from us, but exists in a limbo between real and possible.

The now-classical metaphor for the difference between classical physics and quantum physics was suggested by physicist Edwin Schrodinger: a cat is placed inside a container which has a random event (the decay of a radioactive atom) triggering the release of a deadly gas. The only way to find out what happened is to open the box. According to classical physics, the outcome, whether the cat is alive or dead, is determined. We look in the box out of curiosity about the results. However, the quantum explanation is that the cat is in a limbo represented by Schrodinger's wave function which has the possibility of the cat being alive *or* dead. In Heisenberg's words a wave function is "something standing between the idea of an event and the actual event, a strange kind of physical reality between possibility and reality." In this view, when we look in the box, it is not just a matter of idle curiosity. When we look, and *only* when we do so, the wave function collapses, and one of the possibilities occurs. Until

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Richard Rabkin discussed "Brief Psychotherapy" at the Reality Club meeting of March 11, 1981, held at The New York Academy of Sciences. Richard is a psychiatrist, professor of psychiatry at New York University, and author of Strategic Psychotherapy *(Basic Books, 1977), and* Inner and Outer Space *(W. W. Norton, 1970).* —*John Brockman*

then there is only the wave function. The "real" world is not substantive in the usual sense of a "thing world." (Needless to say, quantum theory has not been shown to apply to macroscopic events like cats by physicists, but only with invisible subatomic particles.)

A PATIENT DOES NOT GO to a physician with a disease. A negotiation takes place in which the vague, formless discontent of the patient is shaped into a disease almost as a sculptor shapes clay. For example, an intelligent young woman complained to me of fourteen different symptoms ranging from the top of her head to her knees. I wrote them down verbatim. When she returned from the medical clinic a few weeks later, it occurred to me to ask about her symptoms. She confidently reported three symptoms, one of which she hadn't mentioned when we had spoken earlier. All the others had been forgotten. In this process called "the cultural construction of clinical reality" by Kleinman, Eisenberg, and Good (1968), something very much like the model of Schrodinger's cat takes place.

All there is at the point at which a person comes to a physician is the potential for a diagnosis of an illness, a Schrodinger wave function, if you will. The patient and the doctor talk. The patient suggests one possibility; the doctor, another. They "negotiate." Finally the wave function collapses into a diagnosis, a reality.

It is very hard to accept this perspective on medical disease. It has been compared to the Indian rope trick. What is remarkable about the Indian rope trick is not that the magician creates the illusion of a rope hanging unsuspended in mid-air. The greatness of the feat lies in the fact that the magician climbs up the rope and disappears. He can actually use the rope. It is not remarkable, when you think about it, that a set of fourteen complaints can be reduced to three. What *is* remarkable is that this construction of reality can be treated and cured.

Most people resist the idea that there are other possibilities. In the case of physics, they want to believe that Schrodinger's cat is alive or dead. In the case of medicine they want to believe that they do or do not have a disease. However, if you can study doctor-patient communication before a diagnosis has been made (and the patient is on the way to specialists), you do not have such certainty. For example, when John Lindsay, former mayor of New York City, fulfilled a campaign promise by developing "little city halls," he had to do so by placing them in medical clinics around the city because he could not get funds from the budget committee who were loyal to another political party. The mechanical paradigm assumes that the activities of the physicians and the lawyers in the little city halls would be independent. Medical cases would come to the clinic, and legal cases to the little city halls. What in fact happened is that many of the cases that came to the medical clinics were sent to the little city halls instead. How did this happen? Well, people came in with vague complaints. Those aspects of the complaint that were political in nature

(for example, about the landlord) were previously not paid attention to by the doctors, whose construction of events was medical in nature. Sometimes 60 percent of the patients were referred to the little city hall instead of the clinic once that choice became available.

When I was in the Air Force, I worked in a general medical clinic with walls sufficiently thin to permit the overhearing of conversations between patients and doctors. There is no question in my mind that patients come to doctors with very unformulated perplexities. What astonished me was the other physicians' lack of awareness. Despite telling me during coffee breaks that they held patients to one and only one complaint, and that one medical, per session, they seemed to have no appreciation for what they were doing.

On some level the recognition of the process was terrifying, and I could appreciate the physicians' not paying attention to it. Yet patients would seem to spill a chaotic set of complaints and observations out at me and my colleagues, covering every conceivable subject. I would struggle with it all and suddenly see that it could be thought of as a particular medical problem — particularly if a lot were overlooked. Then the patient and I would go ahead and treat it as such, and it would become reality. The Indian Rope Trick always worked. The patient would get better, and, if I were lucky, I would forget that existential sense of having to make an absurd choice.

But what would have happened if I or one of the other physicians defined the problem differently? There were innumerable instances when the problem could have been redefined as psychological or interpersonal (for example, a marital problem) and referred to the social work department. These speculations would bother me until the next patient presented his complaints in the same way.

The vague initial "dis-eases" that patients and clients complain about are like formless dough out of which certain shapes are stamped by the moulds available in the culture. These templates, these cookie cutters, are the sicknesses of a particular culture. Should people from another culture reside in New York, they would have to seek out an ethnic healer because our clinicians do not have the same paradigms. For example, Puerto Ricans who come to New York City find that pediatricians cannot treat "empacho," a stomach ache common among Puerto Rican children. They have to find a local healer who can examine the child's abdomen to find the exact spot over which to make the sign of the cross. From our cultural perspective, it is hard to understand what has happened when the child gets better, and sometimes when there is a conflict of paradigms the patient gets diagnosed as having a psychiatric problem. To some extent every medical encounter is a conversation about those templates, those cookie cutters.

When you abandon a "thing world," there is little difference between Schrodinger's Cat and Rabkin's Patient. You may ask at this point how you could possibly deny the reality of a disease, for example heart disease — a patient who has had a coronary bypass operation? You are looking at the situation after everything has been constructed ("negotiated") in a certain fashion. You have come upon Schrodinger's Cat after someone has already opened the box. The answer is very simple: think of the type-A behavior studies. In this paradigm what appears above as coronary artery problems is reframed as personality factors such as time-pressure and aggressive competition, not anatomical problems. Rather than surgery, an effort to change the patient's approach to life becomes the dominant thrust of clinical interest.

The point of view being expressed here should not be confused with solipsism, with the idea that there is no "reality." What is terrifying about the cultural construction of clinical reality is that one must operate in the dark, never really knowing what is "out there." We construct a theory and say to ourselves, "This is the way out of this problem." We follow the path as a blind person must walk the streets. If we succeed, it doesn't mean that we can see what obstacles we avoided. We really don't know if it was the quickest or best path, or what unseen dangers we passed by.

To use a distinction of Von Glaserfeld's, our theories and our diagnoses "fit" in the sense of a key fitting a lock. As burglars know, there can be many keys that open a lock. What our theories and diagnoses are *not* is a picture of reality, or what Von Glaserfeld calls a "match." We only know that our key is "wrong," when we haven't got a fit, when it's too late and our diagnosis, theory, or paradigm breaks down. The death of a patient is God's way of telling us our paradigm was wrong.

THE CLINICIAN and the physicist share in what can be called a "constructionist" view of the world. In this view our paradigms determine how we organize it, but we can determine our paradigms. When a science or clinical discipline reaches this stage in its development, it becomes what Varela, Maturana, and Uribe called "autopoietic," a science that makes itself. Such a science will have two parts: applied and theoretical. Rather than simply being driven by paradigms, we can now steer. No scientific space ship will ever equal it. When the mind moves itself, there are no limits to its exploration. ■

WHAT CAN WE KNOW?

BY GERALD FEINBERG

THE ULTIMATE RANGE of human knowledge and the possibility that there are limitations on it have been of interest to philosophers and scientists for a long time. Plato, Kant and Einstein are just a few of those who have written on the subject. Yet despite this long history of inquiry no real consensus has been reached about whether there are ultimate limits to what we can understand, or even about whether this question is answerable in principle.

Several developments in diverse fields of science and mathematics during the twentieth century have introduced new aspects to the question of how much we can ever know, and the time is ripe to reconsider the question in the light of these developments. The most obvious relevant new factor is the immense and accelerating increase in actual knowledge about the natural world that has taken place during this century. This increase in knowledge has provided answers to many of the perplexing questions of earlier times, such as the mechanism of heredity. Of course, many scientific questions remain unanswered, and some of the questions that have been answered, such as the nature of ordinary matter, have led to unexpected new questions. Nevertheless, the progress of science has convinced many scientists that no questions could ultimately resist the efforts of scientific research to answer them. On the other hand, some scientists, including a number who have taken part in the annual Nobel ceremonies at Stockholm, have tried to define limits to what scientists can ever know. Many of these suggested restrictions have focused on areas that are outside what most people would regard as the scope of science, such as ethics or esthetics.

Some problems are too complex to solve whatever improvements occur in computer technology.

However, there have also been specific discoveries in the fields of physics, mathematical logic, and computation which have raised doubts about whether all questions even within the traditional provinces of science are ultimately answerable. In this article, I focus on whether there are reasons why we will never know some things — rather than with short-term questions about how long it will take us to solve some of the specific problems of science. I concentrate on physics, the most basic of the sciences. Whether we can answer all of the questions in other sciences, such as biology or psychology, either on the basis of knowledge in physics or otherwise, is a separate matter that will not be addressed here. I begin by reviewing some recent discoveries that have made it timely to reconsider the questions of limits to knowledge.

1. Limits to Predicting the Future

One of the unexpected areas in which modern science has changed our views about what kind of knowledge is possible concerns the pos-

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sibility of predicting the future accurately. Before the twentieth century, it was generally believed by physicists that given sufficient information about the present, it was possible to make exact predictions about the future. For example, on the basis of present observations, it is possible to accurately predict the position of the planets for thousands of years into the future. A theory in which this can be done is said to be deterministic. Several challenges to determinism have surfaced in this century. These challenges occur in quantum theory, in relativity theory, and even in certain aspects of Newtonian physics.

The presently accepted description of physical phenomena, quantum mechanics, contains the conclusion that some questions that can be asked about the future behavior of physical objects cannot be answered until the future actually arrives. For example, the position of an individual electron in an atom at some specified future time cannot be exactly predicted in advance, although it is possible to measure and therefore to know this position as accurately as desired when that time comes. Most physicists have accepted this kind of indeterminacy, and believe that it reflects a fundamental property of the microworld. However, others, including Einstein, have suggested that the lack of determinism is a flaw in quantum mechanics, a misleading manifestation on the level that we can presently measure, of a deeper reality that *is* deterministic. Although some efforts have been made to find a theoretical description of such a deeper level of physics, these have not succeeded, and there is no convincing evidence that it is even there to be found.

It is important to recognize that while quantum mechanics forbids us from making exact predictions of such things as future positions, it does not rule out observing, and hence knowing, these same things when and after they have taken place. The position of an electron in an atom at this instant can be determined by direct measurement. Even the simultaneous knowledge of position and momentum, which by Heisenburg's principle cannot be known in the present or the future, can be inferred for the past or the future by measurements that we can do now. Therefore, if our criterion is that we can *ever* know something, rather than know it in advance, quantum mechanics does not appear to restrict this type of knowledge.

Even in deterministic theories such as Newtonian mechanics, problems with predictability can occur in some situations. These limitations arise whenever the future behavior of some system depends very sensitively on its present situation. A simple example of this is a needle balanced on its end, but tilted at a very small angle from the vertical. The future behavior of the needle depends on the precise direction of tilt. A small change in this direction, say from the left to the right, will after a short time make a big difference in where the needle ends up. A more serious example may be the weather at a specific location one week in the future, which is thought to depend on the detailed properties of the atmosphere at present, such as wind speed and temperature all over the world. We cannot make perfect measurements of these present conditions, so there may be many solutions to the equations determining future weather. These correspond to indistinguishable present conditions but lead to quite different predictions about the weather a week from now. Such a situation has been found to be the case for many types of nonlinear equations, studied in an emerging field of science sometimes known as deterministic chaos. We do not yet know whether this phenomenon is actually the case for the weather, but if this type of situation occurs in real physical situations, it raises the possibility that even phenomena for which quantum indeterminacy is unimportant may be effectively unpredictable.

Limitations on computability might also result in situations in which, although some phenomenon is observable, we cannot extract the laws that govern the phenomenon from the data, so that we will be unable to relate it to other scientific principles.

There is another problem in regard to predicting the future. In order to know the future here, we need to anticipate the effects of things that are now happening at some distance. According to the special theory of relativity, such effects propagate through space at finite velocity. Therefore, if we want to know what will happen here in the future, we must wait until light or other signals from distant places reach us. In some circumstances, we can anticipate what will happen on the basis of information that has already reached us. Thus, because of past observations, we can be fairly sure that a rocket from Mars will not reach Earth in the next few seconds, even though the light leaving Mars now will not reach us for several minutes.

However, there are other situations in which we cannot anticipate events that will affect us in the future at all. Imagine that the age of the universe is finite, and that the size of the universe is greater than this age, multiplied by the speed of light. In this case, for an observer at a point in space, labeled A, there are regions

far enough away that no information from there could yet have reached A, so that we do not know anything about these regions, or about anything that might be on the way from there to A. However, at some time in the future, enough time will have elapsed since the origin of the universe that light or other signals from the distant region will reach the point A. These signals could have a large effect on what happens afterward to the observer at A. For example, the signal might involve high energy radiation, which would affect the observer's future lifespan. There is nothing that would enable this observer to anticipate the arrival of this radiation, so that the future after it arrives would be unpredictable before that happens. Similar effects can occur in universes such as the one we inhabit, which are expanding rapidly. It would therefore appear that the finite speed of light restricts how well we can predict the future in ways that are distinct from those of quantum mechanics or of deterministic chaos.

2. Limits to Computability

In contemporary science, many problems are approached by doing elaborate numerical calculations with computers. This suggests that limitations in our capability in doing computations may result in limits in what we can know at all. Work on the question of how effectively specific problems can be solved by computation has shown that some classes of problems appear to require so many steps as to be impossible to complete in any realistically available amount of time, whatever the improvements in computer technology. Such conclusions must be distinguished from similar statements of an earlier era, which were much more tied to the then existing computer technology. The present statements imply that some problems are too complex to solve whatever improvements occur in computer technology. Even computers operating at physical limits, in which the individual operating units were the size of atoms, in which information was exchanged between the units at the speed of light, and which operated for billions of years would come nowhere near carrying out the necessary steps for some computations. This has led to suggestions that similar limitations may exist for other, non-numerical approaches such as the analytic mathematical methods more familiar to many scientists. If this were so, we could not solve these particular problems at all.

This could have important consequences for the general question of limits to knowledge. There may be circumstances in which we are powerless to decide whether or not some specific theory is capable of explaining an observed phenomenon because we are unable to extract the prediction of the theory due to our computational inadequacy. Such situations have occasionally arisen in theoretical physics, for example with regard to the behavior of turbulent fluids, but usually this has been considered a temporary condition, rather than something intrinsic to the problem, whereas now we are considering a situation in which the limitation is permanent. Since computers are often used to analyze experimental data, limitations on computability might also result in situations in which, although some phenomenon is observable, we cannot extract the laws that govern the phenomenon from the data, so that we will be unable to relate it to other scientific principles.

Nevertheless, while these limits on computability definitely exist for mathematical calculations, it is uncertain whether they apply to any questions in science. If a definitive theoretical description was known to apply to some phenomenon, then we might be able to tell whether determining the consequences of that description would require computations that cannot be done. However, there is not a unique theoretical description for natural phenomena. If one such description leads to the need for impossible computations, we have the option of looking for an alternative one, which does not require such computations. That is the usual procedure that scientists follow when faced with a situation in which they cannot calculate an answer. What we don't know is whether we can always find such an alternative, or whether we may eventually face situations in which we can neither compute the consequences of existing theories or find an acceptable alternative theory. If we did get into the latter situation, we would be forced to conclude that limits on computability lead to limits on scientific knowledge.

Complete understanding must involve not only a full comprehension of what we know, but also some sense that there is nothing else to be known.

3. Limitations Arising from Human Finitude

An obvious source for limits on human knowledge is that the capability of our bodies and minds are limited. We are finite creatures of matter and energy, and our minds as well as our bodies may be limited in what they can ultimately accomplish. These limitations might involve both how well we can think and the limitations of our senses and instruments. Just as no human can imaginably jump 100 meters with unaided muscles, so we might expect that there are structures of thought that are beyond the capacity of any human mind to imagine. Can a structure of thought be said to exist if we can never imagine it? This is only an apparent contradiction. It is often possible, for example in mathematics, to prove indirectly that something exists without being able to construct it.

While one might accept that human finitude implies some restrictions

about what we can ever know, that conclusion would not be very interesting until we could get some idea of where these limitations lie. It is imaginable that we might get some such idea through interaction with intelligent nonhuman beings, either an extraterrestrial species, or conceivably, the descendants of our computers, evolved so that their mental processes are different from our own.

The relevance of limitations of our scientific instruments to what we can know is more subtle. The growth of scientific knowledge involves more than pure thought. Experiment and observation involve both our senses, and physical instruments. The use of both senses and instruments are constrained both by laws of nature and by available amounts of energy, time and other physical quantities whose range may be limited. These aspects of the universe which are not completely under our control may limit what we can know by restricting the experiments that can be done. In order to show this, we would need to demonstrate that certain observations cannot be carried out by any methods consistent with available amounts of time, matter and energy. While such restrictions have occasionally been suggested by scientists, there does not seem to be any systematic analysis to determine whether they exist.

The existence of limitations on the capability of our instruments would not quite be the same thing as physicists have found in Heisenberg's uncertainty principle, whose limitations do not depend on availability. However, if the universe is finite, it is very likely that limits of this type also exist. Even if the universe is infinite, the restrictions that relativity theory places on how one part of the universe can influence another, which I discuss below, may still imply that limits of this kind exist.

General Questions About Limits to Knowledge

In order to see better what these different scientific discoveries imply about limits to knowledge, there are several general questions that need to be posed and answered. What does it mean to say that the range of knowledge is unlimited? One way to interpret this statement is that we will someday know everything that has happened or will happen in the universe, on all levels of organization of matter, from subatomic particles through superclusters of galaxies. Most working scientists would probably take this to be the goal of the scientific enterprise.

One might instead consider a somewhat weaker criterion for unlimited knowledge, that there is nothing we cannot eventually know. The first criterion implies that we will achieve that goal, the second that we will continue passing all milestones on the road to it. If there are an infinite number of things about the universe to be known, then these two statements are different, because it is hard to imagine how we could actually ever know an infinite number of things, but we might be able to know any specific one of the infinite number. Even if the number of distinct things to be known is finite, there might still be a difference between the two concepts of omniscience. The first criterion would imply that we would eventually know all of the finite set of things to be known while the latter would be consistent with approaching closer and closer to knowing them all, but never reaching that condition in finite time, somewhat as Zeno* imagined motion to occur. Either of these seemingly simple notions of complete knowledge leads to further profound questions about the nature of knowledge that have not been completely resolved.

There is nothing that we presently know that would tell us when there is nothing more to be known.

A. What Is There to Know?

One question involves what it means to know everything. At any time in history, the criterion for such a condition is highly theory-laden. Our scientific picture at any time identifies certain entities as the ultimate constituents of the universe, and one could say that complete knowledge consists of a full description of the state of all of these entities at all times. For example, our present physical theory identifies these ultimate constituents as certain subatomic particles, and describes them by quantum states that are characterized by a few properties such as momentum and spin. However, few physicists believe that this is an ultimate description in the sense that the known subatomic particles will never be understood in terms of other, more basic objects. Indeed, efforts to do just that are already in full swing.

However, complete understanding must involve not only a full comprehension of what we know, but also some sense that there is nothing else to be known. The latter is even more difficult to achieve. Even if we had complete understanding of everything that had been observed, it is not clear how this could be used to prove that there is nothing else to be discovered. For that reason, it is questionable whether any extension of science as it is now done could lead to the conclusion that we know all there is to know. It is conceivable that some extension of the sociology of knowledge could indicate that the rate of new discovery is slowing down, and will eventually come to a halt. If that happened, it could imply that we had reached the limit of what we will ever know. However, such studies have thus far been confined to specific fields and do not apply beyond those fields. It is also

*The basic idea of "Zeno's paradox" is that you can never get to your destination because, as you run, you go half the remaining distance, then half *that* distance, etc.

possible that other forms of knowledge than science will someday be accepted and that some developments involving these new forms might convince us that we know all there is to know. At present we are unaware of such forms. There is nothing that we presently know that would tell us when there is nothing more to be known.

B. What Can We Observe?

Another question relevant to possible limits to knowledge involves the distinction between theoretical and observational knowledge. It is an article of scientific faith that we know something most surely when we have observed it. One way to construe the view that there are no limits to human knowledge is that there is nothing that we cannot ultimately observe. Of course, even after something is observed there remains the problem of integrating it with the other things that are known into the overall pattern of understanding, but this step takes place in the mind, and so is less dependent on the properties of the outside universe. However, because of some of the results and practices of modern science, even the view that everything is ultimately observable runs into several difficulties.

One difficulty has to do with the division of the universe into the observed and the means of observation. Quantum mechanics has taught us that this is no simple matter, because the means of observation influence what properties can meaningfully be assigned to the observed. Perhaps even within the context of quantum mechanics, this division is innocuous when we are concerned with observing only part of the universe, since under those circumstances, the observing instrument can be included in the part that is not being observed. But this strategy clearly cannot work if we want to observe everything in the universe. In order to do that, we are unavoidably led to the notion of sequential observation, in which the tool of one instant becomes the object being observed at a later instant. By integrating all of the observations made at all times, one might then hope to get complete knowledge of the universe at all times.

This procedure obviously leads to the necessity of making theoretical inferences from observations done at one time, to a situation as it is at another time. This necessity for theoretical inferences about observation arises even without considering the universe as a whole. Most aspects of the universe are not accessible to our unaided senses, and to observe them we must use instruments whose output itself requires theoretical analysis before it can be interpreted as an observational result. This situation is nothing new in science, going back at least as far as the invention of the telescope. What is new is that an ever-increasing part of scientific study involves instruments whose interpretation is heavily theory-based.

In view of this, we must extend any criterion for limitless human knowledge to include the use of theory where it is necessary to supplement observation. Most practicing scientists would be happy with this extension. The criterion would then be that by a combination of observation and theoretical inferences, carried out over an extended period of time, we can determine everything that has ever happened or will ever happen in the universe. This is a weaker conclusion than the one that French mathematician Pierre Laplace made in the context of deterministic Newtonian physics, since in order to carry through the program that is implicit in the present definition, it could be necessary to observe some things as they happen in the future, instead of being able to anticipate them from present measurements as Laplace supposed.

For objects that are beyond a certain distance apart, their relative speed is greater than that of light, so that information about one object can never reach the other.

However, there are several reasons for doubting that even this weaker version of omniscience is tenable. One is the problem alluded to earlier involving the limited accuracy of individual observations. If we need to use the results of future observations to make inferences about the present or the past, then we must consider the accuracy of the whole system of inferences. An individual measurement may be made as accurate as desired, subject to whatever limits are implied by general laws of physics. However, inferences about past or future behavior of a system that are based on such measurements of limited accuracy are, in some circumstances, subject to uncontrollably large uncertainties. For example, a measurement of the position of an object to an accuracy of one percent now may lead to a fifty-percent uncertainty in the past or future position of the object. Whether this occurs depends on the laws of physics that are used to make the inferences. Recent discoveries in deterministic chaos, concerning nonlinear equations, suggest that this phenomenon actually occurs for a very large class of such equations. This result would imply great difficulty in carrying out a program using theoretical analyses to predict or retrodict with high accuracy.

C. How Many Things Are There to be Known?

One aspect of the physical world that may play a decisive role in determining the ultimate range of human knowledge is the extent of the universe in space and time, and the related question of how many entities the universe contains. We do

not know whether the universe is infinite in space or in time. Nor do we know whether there are an infinite number of points in a finite region of space (as would happen if space is continuous), or if space itself is discrete so that there is some minimum possible distance between objects, and only a finite number of points in any region of space. The former is what is assumed in most physical theories, which use continuous functions to describe physical quantities. If the number of objects in the universe is infinite, or if there are an infinite number of possible locations in space-time that objects can occupy, then it would seem that there would be an infinite number of things to be known about the physical world, at least in principle.

However, even if the universe is infinite in size or age, there may be only a finite portion of it that is ever accessible to our observation. This is because the universe is expanding, so that objects far from each other are also in rapid relative motion. For objects that are beyond a certain distance apart, their relative speed is greater than that of light, so that information about one object can never reach the other. This is the one example of a feature of general relativity theory known as horizons. Because of the curvature of space-time and its influence on how light and other objects move, there can be regions of space-time that are accessible to some observers and not to others. A commonly cited example of a horizon is the inside of a "black hole," the region formed after the collapse of a heavy star. This region can be examined by observers willing to make one-way trips into it, but the results of their investigations cannot be transmitted back to those outside.

Most if not all possible universes are believed to contain horizons. These could either be local, as in the case of a black hole, or cosmological, in which case it is a large section of space-time that is inaccessible. The possibility that our universe contains such horizons raises interesting questions about limits to knowledge. Although we can speculate about what lies beyond the horizons, and subject this question to theoretical analysis, we will not be able to obtain observational confirmation of our analysis. This situation would be akin to trying to decide about the life of a character in a novel by a now-dead author after the period covered by the novel. Determining whether our universe contains horizons would be of great interest scientifically, as well as philosophically. For the case of cosmological horizons, this would require knowing something about the overall density of matter in the universe over the past, present and future. Such information is hard to obtain directly, although it might be possible to decide it on theoretical grounds

Horizons are a feature of general relativity theory in its unquantized form. While there is some reason to think that horizons would exist in a quantized form of relativity theory, this is uncertain. Until we have some better idea about the answer to this and other questions about horizons, we will remain uncertain about the ultimate range of human knowledge.

While new developments point in the direction of previously unexpected limits on knowledge, none of them have definitively shown that there are things that we can never know.

Conclusions

We have seen that a number of developments in modern science have raised new aspects to the old question of what human beings may ultimately know. As science progresses, we know more and more, but we are also becoming aware of potential barriers to how far this knowledge may extend. While new developments point in the direction of previously unexpected limits on knowledge, none of them have definitely shown that there are things that we can never know.

What would it take to come to a conclusion about this problem? If we learn the answers to some of the scientific questions described above, we may able to conclude that known scientific principles bar us from knowing certain things. Of course, this conclusion would not be stable against new discoveries that change what we think we know, but nothing within science is exempt from that type of change. For myself, I believe that what we know thus far leaves the possibility open that any question about the universe that human beings can frame will eventually be answered by human beings or their intellectual descendants.

What would the consequences be of a conclusion that there are things we can never know? Much of the scientific enterprise has been stimulated by the notion of limitless horizons for human understanding. A conclusion that there are things that we can never know might lead to a reconsideration of this enterprise. Possibly there would be a general shift of human interest to fields that did not fall within this limitation. Such shifts in interest have occurred before, as, for example, in the eighteenth century, when the best minds turned from a concern with religion to one with science. Some scientists might react to a recognition of ultimate limits to scientific knowledge by abandoning science for other activities. Einstein once suggested that he would do something like that if quantum indeterminacy turned out to be true. Others, including myself, would continue in science, secure in the realization that the limits of individual understanding are in any case more constrained by individual capabilities than by general laws. ■

There Is No Sound In An Empty Room

BY JOAN RICHARDSON

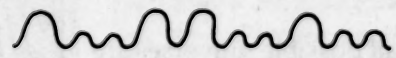
ILLUSTRATIONS BY ELLEN SASAKI

MUSING on the Reality Club issue of *Whole Earth Review* and Wallace Stevens brought me to consider sound, at the same time the most concrete and abstract "reality" of poetry. In 1942 Stevens delivered a lecture entitled "The Noble Rider and The Sound of Words" (later published as an essay and collected in *The Necessary Angel: Essays on Reality and Imagination*,[1] in which he stressed the primary power of the sound of words to help us live our lives. What did he mean? He wrote and spoke at a moment when yet another surge of the century's great violence overwhelmed senses, emotions, and intellect. He foresaw that this violence would only increase and offered in this essay an exposition of how the work of "a possible poet . . . an acutest poet" could help the individuals in a society to survive "the wild, the ruinous waste" the world was quickly becoming.

From the time of Plato, who wanted to banish poets from his ideal republic, we have been aware of the control over the soul made possible by the joining of words and music. In our own very real republic, advertisers have channeled this potential masterfully. We walk down supermarket aisles quietly humming some tune in rhythm with our heartbeats and find ourselves picking up a package of yet another product we don't need. This is one of the unfortunate aspects that Plato perhaps imagined for a less than ideal future.

Stevens accepted the imperfect as our paradise and so understood that compensating for the negative uses to which words and music might be put, there were and are positive, salutary ones. Realizing these has been the work of the greatest poets who in their joining of imagery and sound have given us an access to transcendence, a sense of the sacred.

The repetition of regular vibrations produces sound as opposed to noise, the product of irregular vibrations. Eastern and Western religious orders have, as we know, incorporated the voicing of sounds bound to certain syllables and words into their daily practice of living. The inspiration of air becomes an exhalation that is shaped to return to the universe as sound, not noise. We can imagine the various patterns of some of these sounds, from

a simple to a more complex 

and so on. This is very different from the jagged, uneven patterns we can imagine for the kinds of noise that emanate from ordinary speech, not to mention the heated arguments or rude exchanges we hear around us every day as we shop, work, or simply walk through the streets of our neighborhoods. We don't generally have time to think about being responsible for the noise we make as

1. Alfred Knopf, 1965.

Joan Richardson talked about "Wallace Stevens's Reality Club" in my living room on November 29, 1984. Joan is a biographer, Professor of English at the Graduate School of the City University of New York, and author of Wallace Stevens: Works and Days *(Volume I of three:* The Early Years, *Morrow, 1986).*
—John Brockman

Just as the movement of each pebble on the sea floor causes vibrations that rise up to expire into the air as it mixes with the crests of waves that break upon the shore, so each of our voicings causes vibrations that affect the universe as well.

we move through our days. But, as Edgar Allen Poe reminded us in his essay "Eureka" — borrowing from a perception of Pascal's — just as the movement of each pebble on the sea floor causes vibrations that rise up to expire into the air as it mixes with the crests of waves that break upon the shore, so each of our voicings causes vibrations that affect the universe as well. We ought, then, to become aware of, if not always responsible for, what we give back to our cosmos as we exchange the air that is our breath. Stevens knew Poe's essay, as he knew, too, the effect of participating in hymn singing, having attended weekly church services as a boy and listened to his mother's Sunday singing of sacred songs as she accompanied herself on the piano in their living room.

Stevens also knew of Eastern practices of meditation and had read certain central texts. One of these was a translation of one of the classical T'ang anthologies, *The Jade Mountain, Being Three Hundred Poems from the T'ang Dynasty, 618-906* (translated by Witter Bynner from the texts of Kiang Kang-Hu). In the introduction to that volume, Kiang Kang-Hu notes that the old Chinese thought the ideal number of poems for an anthology to be about three hundred because they believed that by thoroughly coming to know this number of poems, individuals would themselves learn to write poetry. The anthology was to be used in a household much like the Bible was used until recently in the Christian West. It was to be read from every day, aloud, so that all members of the family might enjoy the same suspension in the more perfect atmosphere of sound and image that poetry creates.

It was not surprising, after reading this, to find that Stevens's *Collected Poems*[2] number three hundred and one, the odd poem added, as the Chinese also suggested, to promise opening.

Stevens also learned from his Oriental masters to use the sound imagery of his work to recreate as closely as possible a direct sense of being in nature. Stevens's upbringing in a still-pastoral American setting, as well as his later reading of the Romantic poets, prepared him to give careful attention to the sky and its clouds, trees with their branchings, birds in their song. But it was, in large part, what he learned from reading both Chinese and Japanese poetry and from studying Oriental paintings and prints with their depictions of human beings dwarfed by mountains and driven by rain that enabled him to transform the set of feelings he had been taught as a child to attach to a Christian definition of the sacred into an aesthetic that celebrated as sacred each and every element of the natural world. Stevens made his intricate mind sensitive to the murmurings of streams, the rustlings of leaves, the skritterings of birds, the delicate tones of petals, and attempted to reproduce in the lines he composed a sense of his communion with these things in a trembling present. We, in turn, reading his poems aloud, compose ourselves in this purified state and for a while at least remove ourselves from the exigencies of politics and wars, the chitter-chatter of everyday noise. Our breathing becomes regular, eased into his meditative pentameter pace — Stevens wrote as he walked, jotting his lines in pencil on small slips of paper he carried in his pockets. His long syllables twist and turn through a complex syntax that stops thought and prompts imagining and then leads back to thought once more. All of this is meant to slow us down in our rigorous days, shift our mind's eye from the countless contingencies of daily life to the real world of things as they are. Through his poems we learn to pay attention to the forces of nature that come in their regular rhythms, yet with variations, with every season and with the constant movement of our planet through light and darkness. Stevens understood that this is all there really is, together with our mysterious ability to witness it and know that we are witnessing it. This last aspect is what he meant by the "abstract." The sound of words is the echoing of this activity, the mimicking of the feeling that accompanies participation in "the nothing that is not there and the nothing that is."

Stevens grew up in a generation still attached to filling the "nothing" with something, "something in which to believe" — the idea of God. In his twenties, even after having been exposed while at Harvard during the last three years of the nineteenth century to the various discussions concerning what Nietzsche had proclaimed as the "death of God" — following Darwin's uncovering of our ancestor to be a "hairy quadruped, mostly arboreal in its habits" — the young poet continued to yearn intensely for "something in which to believe." He had heard William James, George Santayana, Josiah Royce, and others attempting to adjust themselves to a world stripped of the myth of heavenly bliss. Gone was the promise of a place where those once loved but dead might be met and loved again, where rewards would be given for present suffering. Stevens came away from Harvard knowing there was no longer a God in his heaven, yet he still felt, as he put it, the "instinct of faith."

As he grew through the years of his maturity, with this knowledge and with this feeling, he substituted communion with nature for the communion of the faithful he had enjoyed as a child and adolescent. He no longer attended church services, though he occasionally wished for the solace of sacred words and music. In separating himself

2. Alfred Knopf, 1954.

The old Chinese thought the ideal number of poems for an anthology to be about three hundred because they believed that by thoroughly coming to know this number of poems, individuals would themselves learn to write poetry.

from his Christian background during this period, he came to understand the constraining influence it had exerted and continued to exert — in spite of his nominal renunciation of it — on what he called "that monster, the body." This was at roughly the same time that Freud shocked his American audience with his "Three Essays on the Theory of Sexuality." It was these combined personal and cultural forces that prompted Stevens to search for a way of being, perceiving, and acting that would simultaneously satisfy the instinct for faith and acknowledge and celebrate human participation in a natural environment purged of myths of punishment. In recognizing his own needs, Stevens recognized the need all have for the most important function of religious participation, the reminder that impelling us and all things there are forces, or a force, that we cannot comprehend fully but in which we rejoice, humbly and proudly.

Stevens knew that in his secular century the Bible and church services could not be expected to fulfill that function, especially for the "enlightened" elite who, on the basis of what they learned about the structure of our "relative" universe, could not or would not any longer participate in outworn religious practices. He understood the danger that the arrogance, or even the indifference, growing out of such an attitude posed to the life of society. While, then, he eschewed a specifically didactic purpose for poetry, he sought to provide through his work a replacement for the once-sacred texts. It was because of the high seriousness of this purpose that Stevens remained committed throughout his lifetime — and often against harsh criticism — to high diction and, on the surface, difficult subject matter, the movement of his mind and spirit "in relation to his world," as he defined his own poetry. Spinoza wrote that anything noble is as difficult as it is rare. Stevens knew this and knew, too, that it was only by exercising his intellect and imagination to their extremest degree that he could hope to hold the attention of those with an equally keen intelligence who might lose sight of their real place in this "planetary pass-pass."

It was, in part, Stevens's association in New York during the teens with a group of individuals who themselves formed a kind of "reality club" that prepared him for the role he took on as a poet. This group was informally organized by Walter Arensberg, an old Harvard classmate of Stevens's and later a man of letters and patron of the arts. The "club" met regularly in his apartment on West 67th Street in Manhattan. Arensberg has recently come to be referred to as the father of "New York Dada," and the group, by extension, as the first Dadaists, since their gatherings and discussions predated the formal naming of the European Dadaists in Zurich. Arensberg was involved with those who put together the Armory Show of 1913, and it was in the studio attached to the Arensberg apartment that Marcel Duchamp lived and worked during his time in New York. Other members of the Arensberg circle included, at various times, William Carlos Williams, Mina Loy, Albert Gleizes, Man Ray, Tristan Tzara, Charles Sheeler, Marsden Hartley, Marianne Moore, Francis Picabia. On the walls hung works by Picasso, Matisse, Braque, Derain, Cezanne, Henri Rousseau, Joseph Stella, Duchamp, Morton Schamberg; on the floor, tables, and mantelpiece stood sculptures by Brancusi, as well as many African pieces.

Arensberg was an avid student of the work of Francis Bacon and of cryptography. He wrote and published three or four books on Bacon, one a cryptographical analysis of Shakespeare's work in an attempt to substantiate further the claim popular around the turn of the century that the playwright and the scientist were one; Arensberg also published a volume on Dante's cryptography. Keenly interested in using puzzles of all kinds to exercise the intellect and imagination — based on a perception of Bacon's about devising practices to keep the mind poised and so ready to discover something new concerning the structure of reality — Arensberg encouraged various mind games amongst his friends. He himself often played seemingly endless games of chess with Marcel Duchamp while one of the poets in the group read a poem

From the time of Plato, who wanted to banish poets from his ideal republic, we have been aware of the control over the soul made possible by the joining of words and music.

composed around some arcane pun. The "game" in this latter instance involved the assembled company in trying to find the key to unlock the poem's layers of meaning. For another part of the evening they would discuss one of their "assigned readings." Among these were Freud's *Interpretation of Dreams* and the issues of *Camera Work* as they appeared; these last contained, for example, the first American printings of some of Gertrude Stein's early writing, as well as the first translations of extracts from the work of Henri Bergson on time, on time and will, creativity, laughter. Arensberg modeled his circle on one that Bacon had fictionally drawn in his *New Atlantis* where the "best and brightest" minds in all fields were to be brought together to live and work. While this vision was utopian, there were nonetheless, as Arensberg realized, possible settings where it might be partially fulfilled. To this end he subtly directed his friends. It was in this atmosphere that Stevens as a mature poet tested the sound of his words as World War I finally shattered the last vestige of the nineteenth century's belief in the myth of Christian and technological progress.

As his own century moved on and through World War II, Stevens became more acutely aware of the necessity of "resisting," as he put it, the "pressure of reality." He understood that only through work that reveals the process of mind attempting to attune itself with the greater order from which it springs can individuals perceive their "bond to all that dust" — the dust from which we came and will return, the dust of particles that move beyond our seeing but that we nonetheless know and name from watching their effects. More specifically, Stevens realized that experientially, for us, it is sound that provides the most constant and direct awareness of the vibration that in its multifarious velocities and phases accounts for all there is.

Stevens had, of course, inherited the Romantic poets' renewed image of their function as aeolian harps, instruments through which the breath of nature passed to produce divine harmonies, and the Symbolists' aspiration to have poetry achieve the pure condition of music. He was well aware, too, that the development of this aesthetic had reached an impasse in terms of what it could accomplish in teaching how to live and what to do because of its rarefaction into what came to be known as "art for art's sake." It became too difficult for the ordinary reader to follow the rhythm and meaning of Mallarme's lines as they strayed across facing pages, or, when they didn't, to guess at the possible semantic significance of a word invented seemingly only for its sound. This was especially true for an American audience, committed even beyond their explicit knowledge of it, particularly after William James, to an essentially pragmatic world view.

While he had learned from and deeply appreciated the English and European traditions, Stevens was strongly American. With the hard-nosed rigor of his good Puritan ancestors, he attempted to understand as well as he could whatever was current in the scientific world of his time. He kept up with the discoveries of Einstein, Heisenberg, Bohr, Planck, and translated what he apprehended about the structure of reality into the lines of his poems. In this way he hoped to revitalize what came to seem "romantic" or merely "aesthetic," in the pejorative senses of both, and to integrate their valuable elements into forms, poems, that would demand the activity of being read aloud. To make readers fully attentive to this end was one of the purposes of "The Noble Rider and The Sound of Words." If with this awareness we then read aloud one of his poems,

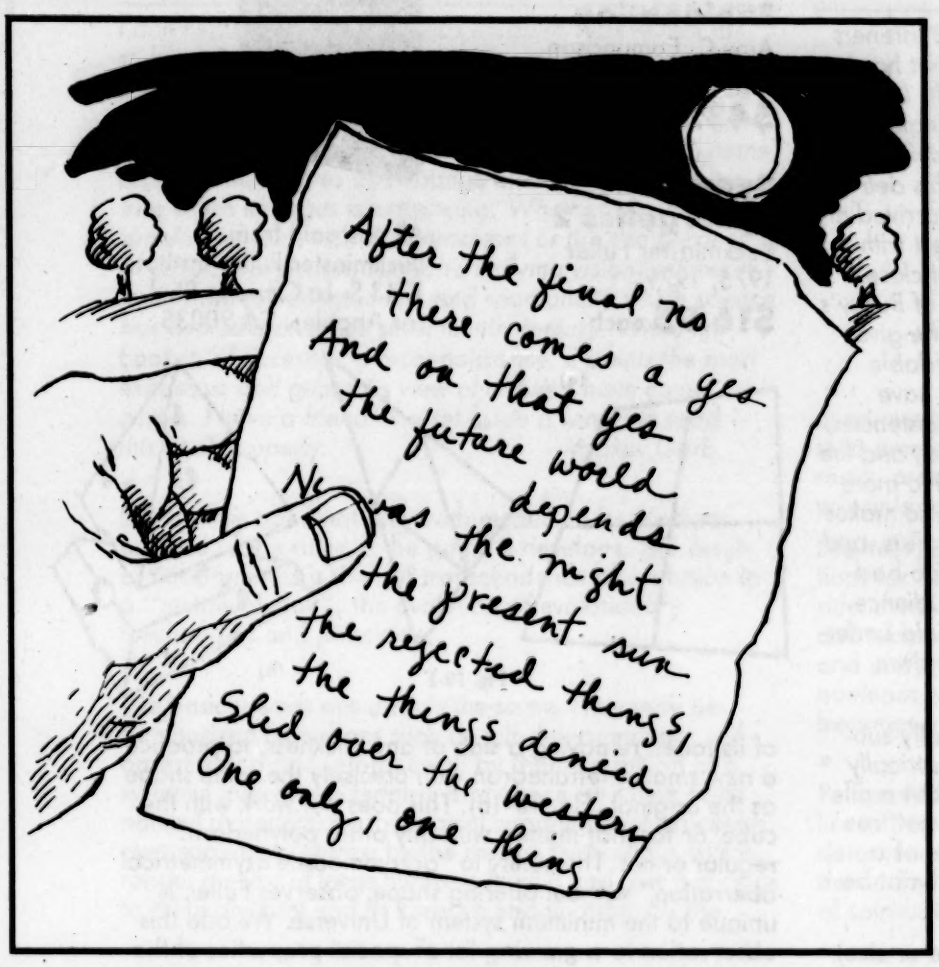
Human Arrangement

Place-bound and time-bound in evening rain
And bound by a sound which does not change,

Except that it begins and ends,
Begins again and ends again —

Rain without change within or from
Without. In this place and in this time

And in this sound, which do not change,
In which the rain is all one thing,



In the sky, an imagined, wooden chair,
Is the clear-point of an edifice,

Forced up from nothing, evening's chair,
Blue-strutted curule, true — unreal,

The centre of transformations that
Transform the transformation's self,

In a glitter that is a life, a gold
That is a being, a will, a fate.

what do we experience? The very nature of our "human arrangement of intellect rubbing against the nonsense of sound, of feeling the driving circles of rain move us, un-place-bound and un-time-bound: we are inside the experience of another man in another place and time while we are simultaneously place-bound and time-bound in our own place and time. The experience of the poem both contradicts and affirms our intellectual sense of things while the sound provides the only true constant — that within that shimmering frame of paradox, in voicing the syllables once spoken by the poet, we are feeling precisely the same flow of energy move us. We, in short, participate in the mystery of being and of being human. Simply to stop at least once in our overwrought days to move and be moved through a reflection on and of the process of being is to in some small way become aware of the sacred, what is beyond the power of words unbound to sound to communicate immediately and experientially.

Curiously — or, again, paradoxically — becoming fully attentive to the present process of our being, becoming, that is, fully self-conscious in this way also frees us from self-centeredness since we recognize ourselves in such extended moments as nothing more than patterns of waves channeled through an instrument tuned by a finer hand than we can ever see. Even without this apprehension — that might seem or sound to some quasi-mystical and so unacceptably soft-minded — there is the more direct understanding that in giving ourselves, our attention, to the shaped thoughts and feelings of another being in another place and time we have expanded our sense of what it means to be human. If, as in the case of Stevens, the subject to which he draws our attention is not simply his self but the movement of his mind as it regards the various aspects and elements of the natural world, then our sense of the human is stretched to its proper limit of seeing and feeling ourselves part of a much larger universal order.

As Stevens stressed again in closing "The Noble Rider and The Sound of Words," the more the pressure of external events threatens to violate our senses, emotions, and intellect, the more necessary it becomes to resist with all the power and resources we can manage to make ourselves aware of the "true" reality, the things we can never forget. (The Greeks knew this in their very voicing of the word for truth: it translates literally as "that which cannot be forgotten.") Unfortunately, our word for this same reality, "truth," does not enforce the remembrance. But Plato knew and Stevens knew that it is the changing of light, the dance of our planet with the sun that makes our seasons, the sound of the sea, the gray driving of rain, the fierce flying of birds, their songs, the myriad mysteries that we witness and participate in every moment of our lives that cannot be forgotten. These are the things that the sound of words in Stevens's poems help us remember and regard. In coming to know these things, we come to know ourselves. As Stevens put it:

> The mind has added nothing to human nature. It is a violence from within that protects us from a violence without. It is the imagination pressing back against the pressure of reality. It seems, in the last analysis, to have something to do with our self-preservation; and that, no doubt, is why the expression of it, the sound of its words, helps us to live our lives. ■

A Fuller Explanation

Buckminster Fuller's lectures tended to inundate listeners in a deluge of facts and concepts — inspiring, but hard to cope with. Much of his writing is equally difficult. I can recall spending hours attempting to untangle a single page. His explorations in geometry may be the most difficult of all, even when edited by a disciplined hand in his definitive ***Synergetics*** *and* ***Synergetics 2****. Help has arrived at last. Amy Edmonson, just out of Harvard, worked with Bucky during the last three years of his life. That close contact enabled her to portray the atmosphere of Bucky's office and what it was like to work with him as she gives us an intimate guide to understanding the formidable* ***Synergetics*** *books. Make no mistake, you'll still have plenty of work to do. But Bucky's seeming inconsistencies, the varying nomenclature for similar phenomena, and the braided definitions are all cleared up just fine. No more "I wonder what he meant by this?" The book also makes Fuller's work much more accessible to nonspecialists, and should help spread his still-very-current ideas. Too bad about the price; that's because of the limited audience for this sort of thing. Some friend of Bucky's should underwrite a paperback.* —*J. Baldwin*

A Fuller Explanation
Amy C. Edmundson
1986; 302 pp.
$42.50

Synergetics/ Synergetics 2
Buckminster Fuller
1975, 1979
$16.95 each

All postpaid from:
Buckminster Fuller Institute
1743 S. La Cienega Blvd.
Los Angeles, CA 90035

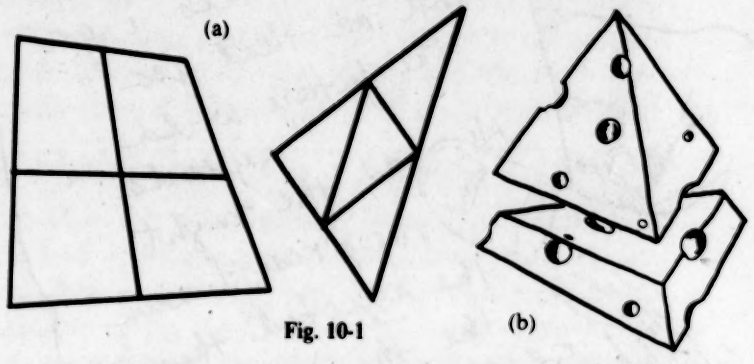


Fig. 10-1

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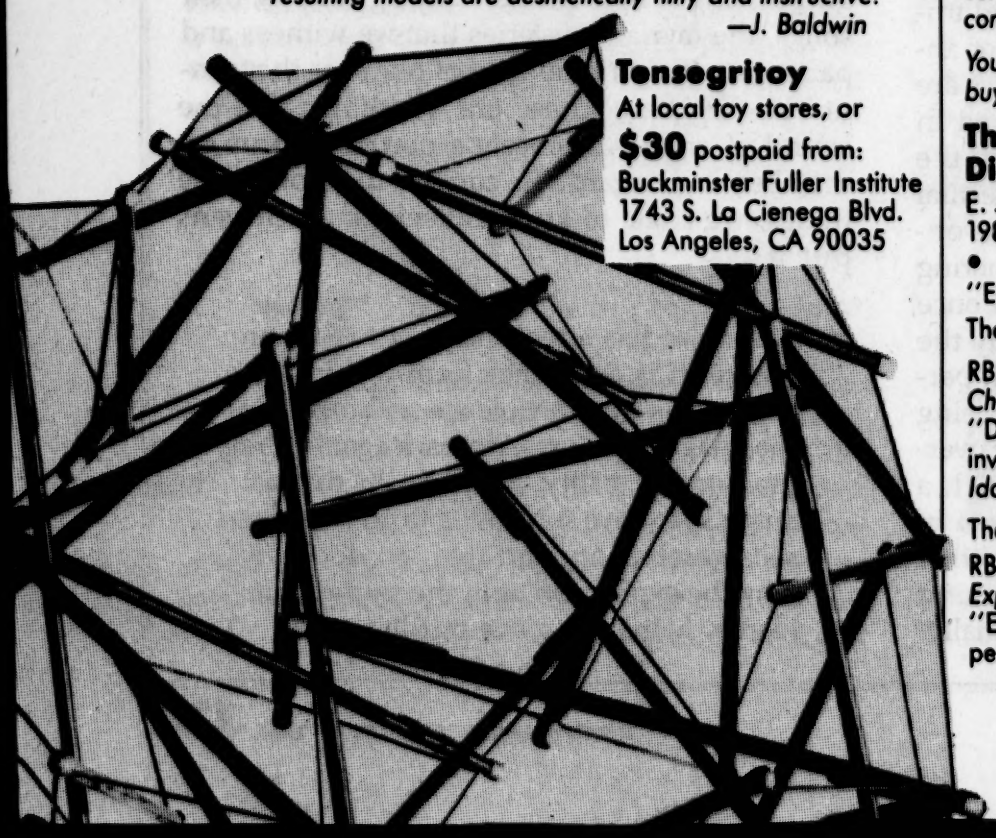
A triangle, no matter how irregular, automatically subdivides into four identical triangles — all *geometrically similar* to the original, that is, the same shape but a different size. Observe in Figure 10-1a that this is not true for the quadrilateral. Excluding the special case of a parallelogram, the four small quadrilaterals will not be similar to their framing shape.

Now, on to space! A tetrahedron (of any shape or size) carved out of firm cheese can be sliced parallel to one of its faces, removing a slab of any thickness, to produce a new smaller tetrahedron with precisely the same shape as the original (Fig. 10-1b). This does not work with the cube, or for that matter, with any other polyhedron, regular or not. The ability to "accommodate asymmetrical aberration" without altering shape, observes Fuller, is unique to the minimum system of Universe. We add this observation to a growing list of special properties of the tetrahedron.

Tensegritoy

Bucky claimed that the strongest structures using the least material would be made according to the principle of tensegrity — where the compressive and tensile components of a structure are separate from one another. The first tensegrity model was made by a student of Bucky's, Kenneth Snelson. He must have been quite adroit; tensegrity models are notoriously difficult to make without unseemly bulges or fatally unbalanced tension. (In my own case, discouragingly so.)

The clever Tensegritoy kit allows even an undextrous klutz to make successful models of several geometric forms. The parts are nicely made from painted wood and elastic, and the directions are illustrated in minute detail. The resulting models are aesthetically nifty and instructive. —*J. Baldwin*



Tensegritoy
At local toy stores, or
$30 postpaid from:
Buckminster Fuller Institute
1743 S. La Cienega Blvd.
Los Angeles, CA 90035

Synergetics Dictionary

Before he died, Bucky Fuller arranged to have his scattered notes installed on some 22,000 five-by-eight-inch cards. Egad! These are now available in a four-volume, 2,800-page book set. Each card deals with an idea — a definition or a group of related thoughts. Some are conversations or fragments of lectures. This is a collection of parts rather than of wholes. Your voyage through this mass will be one of discovery. As Fuller himself said (on one of the cards), "I am not a creator, I am a swimmer, a dismisser of irrelevances." Now then . . . the price. A pity, but so far it's obviously just for libraries.

There has been some talk of developing an interactive computer version. For more information on that possibility, contact Tony Gwilliam, 151 N. Alvarado, Ojai, CA 93023.

You can help the Fuller Institute with their finances by buying the Dictionary through them. —*J. Baldwin*

The Synergetics Dictionary
E. J. Applewhite, Editor
1986; 2,800 pp.

$450 postpaid from:
Garland Press
136 Madison Avenue
New York, NY 10016

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"Enter With Your Word: Exit With Fuller's." —*Cite EJA*

The dictionary is not cheap.

RBF Definitions
Cheap:
"Don't say cheap when you mean inexpensive. Cheap involves deliberate inefficiency." —*Cite RBF to EJA, 3200 Idaho, Wash., DC; 19 July '76*

The dictionary is expensive.

RBF Definitions
Expensive — Nonthinking
"Expensive equals nonthinking. Expensive is 'ex' + pensive." —*Cite RBF to EJA*

The Self-Organizing Universe

I don't know how this book has escaped ***WER*** *review for so long. Its main theme is an exploration of how most natural systems seem to behave: they make things up as they go along. Author Erich Jantsch shows the commonalities in the way in which seemingly different systems organize themselves and change over time, and the picture which emerges is entrancing. Whether discussing simple inorganic chemical processes or the complexities of cultural revolution, Jantsch's unifying vision restores to nature the self-directedness and spontaneity which science has denied it since the seventeenth century. While the book is, of necessity, a reconnaissance, it paints the most expansive and generous view of nature I have come across. I have a friend who set aside a winter to read this book properly.* —*Yaakov Garb*

The Self-Organizing Universe
Erich Jantsch
1980; 343 pp.
$19.25
($20.25 postpaid) from:
Pergamon Press, Inc./
Maxwell House
Fairview Park
Elmsford, NY 10523
or Whole Earth Access

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Evolution is open not only with respect to its products, but also to the rules of the game it develops. The result of this openness is the self-transcendence of evolution in a "metaevolution", the evolution of evolutionary mechanisms and principles.

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The basic themes are always the same. They may be summarized by notions such as self-determination, self-organization and self-renewal; by the recognition of a systemic interconnectedness over space and time of all natural dynamics; by the logical supremacy of processes over spatial structures; by the role of fluctuations which render the law of large numbers invalid and give a chance to the individual and its creative imagination; by the openness and creativity of an evolution which is neither in its emerging and decaying structures, nor in the end result, predetermined. Science is about to recognize these principles as general laws of the dynamics of nature. . . .

Life itself, in particular, creates the macroscopic conditions for its further evolution — or, viewed from the other side, the biosphere creates its own microscopic life. Micro- and macrocosmos are both aspects of the same, unified and unifying evolution. Life appears no longer as a phenomenon unfolding *in* the universe — the universe itself becomes increasingly alive.

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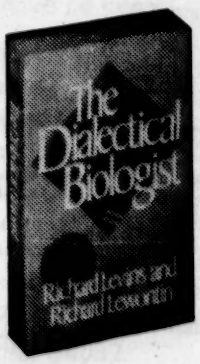
Perhaps the most profound political paradox of our time lies in the need for "elitist" fluctuations to turn self-determination into evolutionary, creative self-transcendence. The only alternative is equilibrium — the equilibrium of spiritual, social and cultural death.

The Dialectical Biologist

There have been many vague (though impassioned) critiques of Cartesian reductionism, but here two accomplished Harvard biologists tackle its assumptions with competence and clarity at a nitty-gritty level, and the result is quite compelling. Reductionism makes a fundamental distinction between parts and wholes, causes and effects. Wholes can be analyzed in terms of their constituent homogenous parts which exist independently of the wholes which they come together to make. While this approach has worked well in some areas, it stumbles when confronted with the complexity of biological systems, and especially in areas like ecology, evolution, neurobiology, and developmental biology. The authors challenge these reductionist assumptions, very powerfully demonstrate their shortcomings in thinking about problems in evolution, and propose new principles for analyzing nature which are grounded in a dialectical world view. Dialectics, best known through the works of its recent representatives Marx and Engels (though it has a heritage extending back at least as far as Heraclitus and Lao Tzu), proves itself here as a highly relevant, viable, exciting and probably necessary way of looking at the world. Includes interesting chapters on the social dimensions of science (e.g., "The Commoditization of Science").
—*Yaakov Garb*

The Dialectical Biologist
Richard Levins
and Richard Lewontin
1985; 303 pp.
$8.95
($10.45 postpaid) from:
Harvard University Press
79 Garden Street
Cambridge, MA 02138
or Whole Earth Access



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The most remarkable property of living organisms is that they have avoided biologically the chemical laws of mass action and the high energy needed to initiate most chemical reactions; both have been accomplished by structure. The structure of the genes themselves, and the way they are held together in very large macromolecular structures, makes it possible for gene replication and protein synthesis to take place even though there is only a single molecule of each gene in each cell. The structure of enzymes, in turn, makes it possible to carry out at ambient temperatures chemical reactions that would otherwise require great heat.

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A third dialectical principle, then, is that the interpenetration of parts and wholes is a consequence of the interchangeability of subject and object, of cause and effect. In the alienated world objects are the passive, caused elements of other active, causal subjects. In evolutionary theory organisms are usually seen as the objects of evolution: through natural selection, autonomous changes in the environment cause adaptive alterations in the passive organism. . . . The actual situation is quite different. Organisms are both the subjects and the objects of evolution. They both make and are made by the environment and are thus actors in their own evolutionary history.

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Change was increasingly seen as superficial, as only appearance, masking some underlying stasis. Even in evolutionary theory, the quintessential study of change, we saw the deep denial of change. Evolution was merely the recombination of unchangeable units of idioplasm; species endlessly played musical niches; the seemingly sweeping changes through geological time were only prolongations of the microevolution observed in the laboratory; and all of it was merely a sequence of manifestations of the selfish gene in different contexts of selfishness.

Reflections on Gender and Science

Evelyn Fox's book goes beyond the (important) questions of equity in opportunity for men and women in the sciences to explore the ways in which gender affects science at the most fundamental levels. She asks and begins to answer some fascinating and crucial questions: in what ways is the very nature of science determined by conventional gender roles? How are the notions of "objectivity" and "reason" constructed through opposing "masculine" traits to "feminine" ones? Why have science's metaphors for relating to nature been gendered? Is an alternative and healthier notion of objectivity possible, one that would balance the contradictory pulls of detachment and connectedness? What would a feminist science look like? The cliche is true: after reading this book you'll never again look at science in quite the same way.

—Yaakov Garb

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The fact that the scientific population is, even now, a population that is overwhelmingly male, is itself a consequence rather than a cause of the attribution of masculinity to scientific thought. What requires discussion is a *belief* rather than a reality, although the ways in which reality is shaped by our beliefs are manifold and also need articulating.

How does this belief manifest itself? It used to be commonplace to hear scientists, teachers, and parents assert quite baldly that women cannot, should not, be scientists, that they lack the strength, rigor, and clarity of mind for an occupation that properly belongs to men. Now that the women's movement has made such naked assertions offensive, open acknowledgment of the continuing belief in the intrinsic masculinity of scientific thought has become less fashionable. It continues, however, to find daily expression in the language and metaphors we use to describe science. When we dub the objective sciences "hard" as opposed to the softer (that is, more subjective) branches of knowledge, we implicitly invoke a sexual metaphor, in which "hard" is of course masculine and "soft" feminine. Quite generally, facts are "hard," feelings "soft." "Feminization" has become synonymous with sentimentalization. A woman thinking scientifically or objectively is thinking "like a man"; conversely, a man pursuing a nonrational, nonscientific argument is arguing "like a woman."

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To the extent that science is defined by its past and present practitioners, anyone who aspires to membership in that community must conform to its existing code. As a consequence, the inclusion of new members, even from a radically different culture, cannot induce immediate or direct change. To be a successful scientist, one must first be adequately socialized. For this reason, it is unreasonable to expect a sharp differentiation between women scientists and their male colleagues, and indeed, most women scientists would be appalled by such a suggestion.

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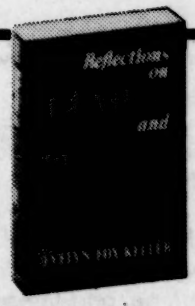
My vision of a gender-free science is not a juxtaposition or complementarity of male and female perspectives, nor is it the substitution of one form of parochiality for another. Rather, it is premised on a transformation of the very categories of male and female, and correspondingly, of mind and nature.



Reflections on Gender and Science
Evelyn Fox Keller
1985; 193 pp.
$6.95
($8.40 postpaid) from:
Yale University Press
92A Yale Station
New Haven, CT 06520

or Whole Earth Access

Military Enterprise and Technological Change

No glib references to "the military-industrial complex" mar this detailed look at eight very different examples of technology changing the military and civilian social structure. Examples range from the rise of what we now call manufacturing — the need for uniform weapons parts and ammunition in the early 1800s — to the effects of military requirements on business management methods. There are appalling chapters on the reluctance of the Navy to accept radio, and on the failure of Henry Ford's attempts to mass-produce naval vessels by using automobile assembly line technique. Happily, all this is easy to read. I found the book to be truly educational in that it renders current military procurement shenanigans easier to understand, and it illuminates more general problems with society's assimilation of any new technology.

—J. Baldwin

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The traditional power of a commanding officer to do as he felt best with his ship or command as soon as he got out of sight of land would have been completely wiped out if someone in the Bureau of Navigation or elsewhere could give him orders. So often the instructions to the wireless room were to shut down the wireless and not to acknowledge calls from shore at all.

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In this chapter David Hounshell examines the Ford Motor Company's ill-fated attempt to mass-produce Eagle boats for the U.S. Navy during World War I. The effort foundered for a number of reasons, but among the most prominent were the company's unbridled confidence in the wide applicability of its assembly-line methods as well as its failure to recognize that marine engineering involved design problems and construction techniques different from auto making.

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The exaggerated emphasis on capital-intensive methods and automation increases system unreliability (an effect perhaps most obvious in the military itself) while at the same time eliminating irreplaceable human skills — a trend even John Parsons, the inventor of numerically controlled machine tools, finds insane and shortsighted. (Parsons was trained in manufacturing by an all-around Swedish machinist, precisely the type of person being lost.) In addition, the military imperatives contribute to dislocation and displacement and ultimately to structural unemployment. This ultimate social cost is now being endured by workers everywhere, invisibly and silently. But that low profile will not last long, for it will soon become obvious to all of us that there is simply no place for these people to go — no farms, no factories, no offices. Faith in the inevitable new industry which will absorb them rings hollow.

Military Enterprise and Technological Change
Merritt Roe Smith, Editor
1985; 391 pp.
$30
postpaid from:
The MIT Press
Attn.: Order Dept.
28 Carleton Street
Cambridge, MA 02142

The Beaches Are Moving • Living with the Shore Series

Beachfront buildings must be considered temporary. If you don't agree, ***The Beaches Are Moving*** *will probably change your mind. Oh, you can slow the process down, probably, and the authors tell you how. They also give good advice on locating and strengthening your structure. But realism in real estate must eventually defer to realism of the physics of wind, wave, and sand. Predicting when a shoreline change will occur isn't easy; predicting whether it'll change is: it will.*

The ***Living with the Shore*** *series may include the shore you know — there are eleven books now. A typical title,* ***Living with the California Coast****, specifically analyzes every beach from Oregon to Mexico, showing (with maps) which are most and least stable, what the local problems may be, the basic geology, erosion patterns, wave action and the frequency and speed of the changes. Lots of photographs, many taken of specific locations at different dates, drive home the inevitability of natural forces that operate despite the dreams of property owners and the assurances of land sellers. Each book in the series also presents most of the basic information (and many of the same illustrations) as the more general* ***The Beaches Are Moving****. If you plan to buy or build near a shore, your research starts with these books.* —*J. Baldwin*

[Suggested by Allston James]

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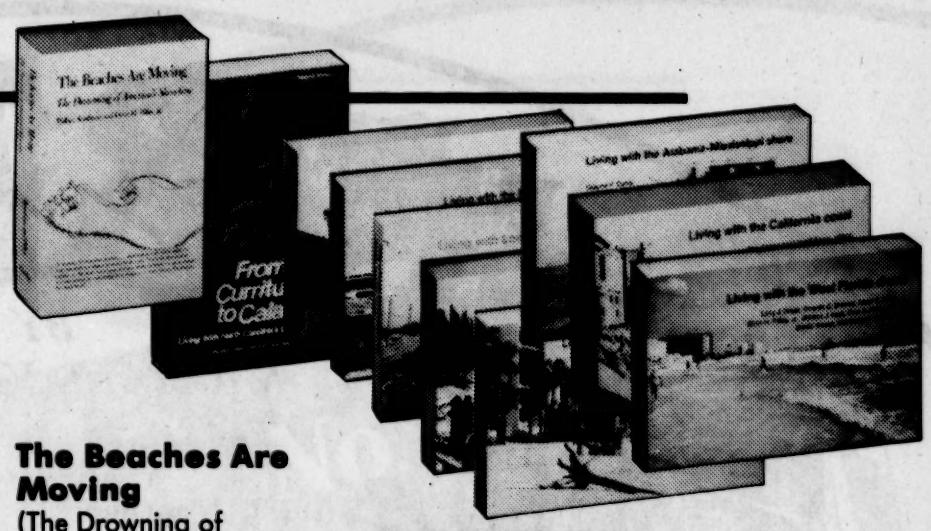
The solutions

1. Design to live with the flexible coastal environment. Don't fight nature with a "line of defense."
2. Consider all man-made structures near the shoreline temporary.
3. Accept any engineering scheme for beach restoration or preservation as a last resort, and then only for metropolitan areas.
4. Base decisions affecting coastal development on the welfare of the public rather than the minority of shorefront property owners.
5. Let the lighthouse, beach cottage, motel, or hot dog stand fall when its time comes.

—*Living with the Louisiana Shore*



The Beaches Are Moving
(The Drowning of America's Shoreline)
Wallace Kaufman and Orrin H. Pilkey, Jr.
1983; 330 pp.
$10.95
($12.90 postpaid) from:
Duke University Press
6697 College Station
Durham, NC 27708

Living with the Shore Series *
Orrin H. Pilkey, Jr. and William J. Neal, Editors
(see * for prices) from:
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6697 College Station
Durham, NC 27708
or Whole Earth Access

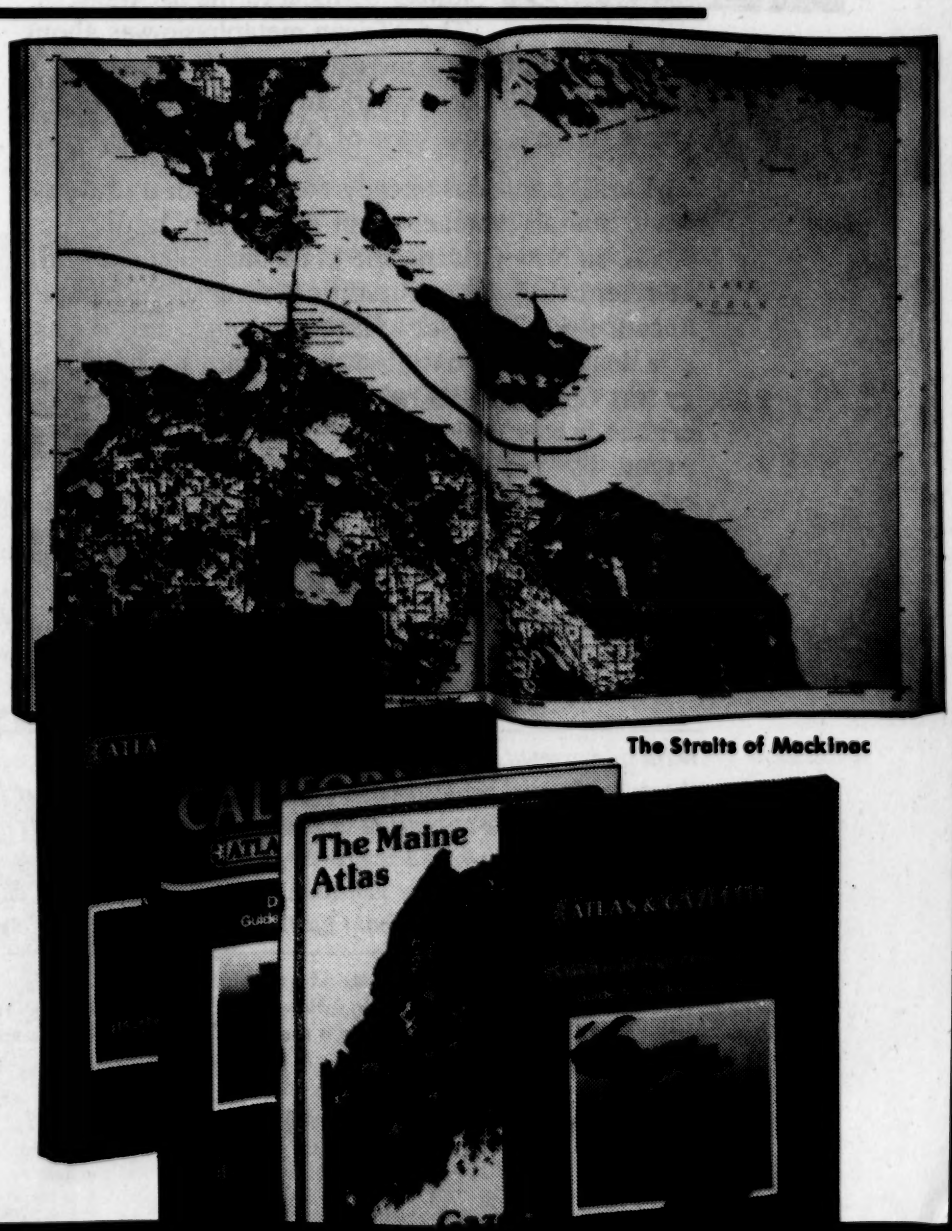
* Alabama-Mississippi, $11.95; California, $14.95; Currituck-Calabash, $11.95; Florida (east), $11.95; Florida (west), $11.95; Long Island's South Shore, $9.95; Louisiana, $9.95; New Jersey, $12.95; Puget Sound and Georgia Strait, $12.95; South Carolina, $9.95; Texas, $9.95. Include $1.95 per copy for postage and handling.

DeLorme Atlases and Gazetteers

This emerging series of 11 x 15½-inch atlases of several states of America has an interesting history. In 1975, Maine outlawed the floating of logs down rivers to paper mills because of environmental damage. Suddenly the loggers were using trucks and roads, and no one had a decent map. Enter ***The Maine Atlas****, which even now is still the best-selling book in Maine each year. Atlases are currently available for the following states: Michigan, Florida, Pennsylvania, New York, Vermont, New Hampshire, Maine and Northern and Southern California. Atlases for additional states are in progress.*

For Northern California, each two-page spread covers an area of roughly 35 by 47 miles. The best thing about them is that they are up to date — they are not simply old Geological Survey maps scaled down and repackaged. New roads, including many recent subdivisions, are included, and the Gazetteer section for California accesses things like whitewater, botanical gardens and wineries. The worst thing about the California pair of Atlases is that they have the contour intervals and elevations expressed in meters. Mostly. Some peaks have no height listed, and some are listed in feet. (Maine is entirely in feet, Michigan is in feet and meters.) The reason for this metric mishmash, according to the company, had to do with "conforming to an international cartographic standard"; I find it an annoying drawback to an otherwise excellent series.

—*Richard Nilsen*



The Straits of Mackinac

DeLorme Atlases and Gazetteers
$10.95-$12.95
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P. O. Box 298-WH, Freeport, ME 04032

HEAR THAT LONG

BY
MICHAEL VENTURA

Voodoo Fire in Haiti

WE ARE IN New Orleans, circa 1890. We know the depth and range of the African metaphysic as it is alive in the black culture of that moment. The twentieth century is already taking hold. Congo Square has been empty for fifteen years, to become a quiet park and then, in our day, a sports auditorium. (That Indian holy ground seems destined to be the place where people release themselves in abandon.) Bayou St. John and Lake Pontchartrain have seen the last time that thousands would gather in a Voodoo celebration. What observers would describe as genuinely African drumming and dancing would continue in New Orleans into the first part of the twentieth century, but it would no longer be focal to the life there. The African metaphysic was about to blend with black-American needs, European instruments, and Euro-American musical forms to create the first great wave of American music.

The brass band was already an American tradition when Sousa's marches swept the country in the 1890s. In New Orleans, the brass band blended with another living African tradition, vivid in Voodoo: ancestor worship. Not to hire musicians, not to feast at a death, would have been sacrilegious. The liturgy was Christianist now, but the impulse for the ceremony was African — or, to use another word, pagan. For it is no accident that what most closely resembles an old New Orleans funeral is an Irish wake — these are the two modern cultures that are most in touch with their non-Christianist roots.

The more socially acceptable, light-complexioned, and financially well-off Creole musicians — many of whom came from free people of color and not from slaves — tended to play their instruments "correctly," to read music, and to play for white functions. The darker, poorer, slave-rooted Negroes — as they were called at the time, distinguishing them from Creoles — played a very different music, closer both to Africa and to the blues. These were the people who came directly out of the Congo Square dances and the Lake Pontchartrain celebrations, and they played their Western instruments with the simultaneity, interchange, and percussive force of African music. They looked to their instruments for a different sound entirely, and got it. They played a lot of blues — which was the sound Africans had created when, in the United States, they had been deprived of their drums, forbidden to sing their tribal songs, and usually even forbidden, during slavery, to have their own Christianist churches. The blues was everything African that had been lost, distilled into a sound where it could be found again. And the blues was the losing and the finding, as well. One man could play the blues. So it was a form that allowed one man to preserve, add to, and pass on what in its native form had taken a tribe. Its beat was so implicit that the African, for the first time, didn't need a drum. The holy drum, the drum that is always silent, lived in the blues. One man with a guitar could play the blues and his entire tradition would be alive in his playing. Louis de Lisle "Big Eye" Nelson, considered the first man in New Orleans to play a "hot" clarinet, told Alan Lomax from his final sickbed in the 1940s, "The blues? Ain't no first blues. The blues always been. Blues is what cause the fellows to start jazzing."

With unexpected, compelling evidence, Michael Ventura asserts that rock music, TV evangelism theatrics, Baptist pentecostalism, jazz and much else of our pop culture has its parenthood in voodoo. Originally appearing in Ventura's brilliant column in the progressive L. A. Weekly, *we reprint from* Shadow Dancing, *an anthology of his essays (published by Jeremy P. Tarcher, copyright 1985 by Michael Ventura). This is part two. You can catch part one by purchasing* WER *back issue #54 from the Whole Earth Access Company (see p. 139).* —*Kevin Kelly*

Right: Buddy Bolden (standing second from right) played raunchy, hard-driving blues for dancing in 1890s New Orleans. His music had a big influence on other blues players — and his audiences. If too few people showed up for a dance, legend has it that he'd blow a few riffs towards town to "call his children home."

SNAKE MOAN

PART TWO

Everyone there at the time said that the first man to play what came to be called "jazz" was the cornet player Buddy Bolden, sometime in the early 1890s. And what he usually played was the blues.

Here was the African metaphysic distilled by American circumstances into an extraordinarily supple form and played on European instruments with African simultaneity in an American-marching-band lineup. Here was the fruit of the hundred years' cohesion of New Orleans black culture — the sense of shared heritage, the sense of identity, fostered and exemplified by Marie Laveau. Here was a metaphysics finding, for the first time, an authentically American voice. What had been played at Congo Square was African music. What was played by Sousa and the popular songsters of the time was still a music derivative of Europe — especially of English music halls and Scotch-Irish airs. What Buddy Bolden started to play was American music. Within thirty years its impact would make an American tune instantly distinguishable from a European tune, no matter how strait-laced the music. And it would be a music, in all its forms, that would reject Puritan America. Even at its mildest it would have a beat, and in that beat would be everything that denied the split between the mind and the body.

In rural blues, all this had been and would be implicit in the tense containment of the form. In Buddy Bolden's music, the implicit would instantly become explicit.

Buddy Bolden. "On those old, slow blues," trombonist Bill Matthews remembered, "that boy could make the women jump out a window. On those old slow, low-down blues, he had a moan in his cornet that went all through you, just like you were in church or something." Words are as close as we'll get to how Buddy Bolden sounded — no black jazz band recorded till 1920, and none recorded extensively until 1923; a precious quarter-century lost — but it's significant that people talking about this very secular music very often reach for sacred images. "Like you were in church or something."

"His playing had one indispensable feature, 'the trance.' He had the ability," wrote Harnett Kane

Stomping The Blues

Above: Blind Lemon Jefferson was among the first blues shouters to really let go on records. This ad is for one of his series of "snake songs," late 1920s.

in 1949 from descriptions of people who'd been there, "to immerse himself into the music until nothing mattered but himself and the cornet in fast communication."

Eighty years after Bolden, the jazz pianist and composer Cecil Taylor would use the same word that Kane's informants had used. "Most people don't have any idea what improvisation is . . . It means the magical lifting of one's spirits to a state of trance . . . It means experiencing oneself as another kind of living organism, much in the way of a plant, a tree — the growth, you see, that's what it is . . . it's not to do with 'energy.' It's to do with religious forces."

Another musician-composer, Sun Ra: "I wanna . . . put them in a sort of dream state between myth and reality. I'm dealing with myth, magic, things of great value."

And Cecil Taylor once more: "Part of what this music is about is not to be delineated exactly. It's about magic, and capturing spirits."

Thus here are the terms of Voodoo made explicit as the aesthetic of an art.

As for Buddy Bolden, we only know for sure one thing he ever said. Many have quoted it, but the New Orleans trombonist Kid Ory put it best when he remembered: "I used to hear Bolden play every chance I got. I'd go out to the [place] where he was [to be] playing, and there wouldn't be a soul around. Then, when it was time to start the dance, he'd say, 'Let's call the children home.' And he'd put his horn out the window and blow, and everyone would come running."

Let's call the children home.

That's what this music is for.

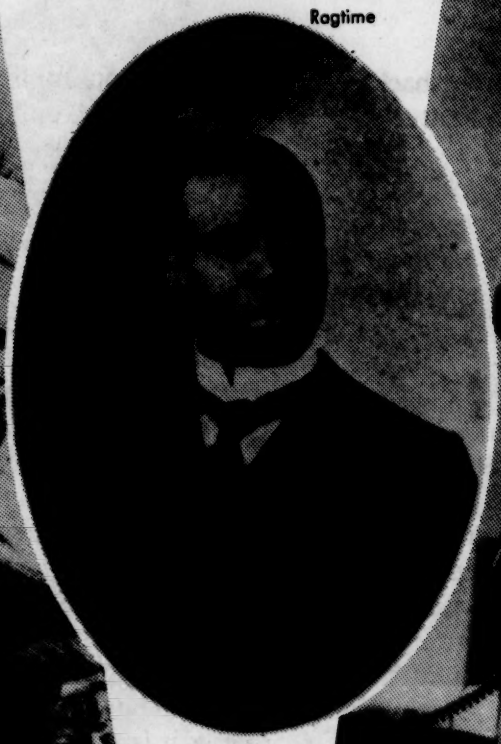
Black Beauty, White Heat

THE MUSIC was nurtured and grew from Voodoo, but as soon as it was itself and no longer strictly African it kept Voodoo's metaphysic wordless within it and jettisoned the trappings. The overt practice of Voodoo faded at the very moment the music was born, as though it had done its job here. Voodoo imagery would live in the lyrics and song titles through all the music's forms — jazz, blues, rhythm and blues, rock'n'roll and even some gospel — until the present, and many of the mojos sung about were real indeed. There is a lot of Voodoo practiced in the United States even now, particularly in New York, but it is furtive, scattered.

On a deeper level of consciousness, the archetypal snake, Damballah, would be sung of constantly and take many meanings. "I got a great long snake crawlin' around my room" is something Blind Lemon Jefferson, the first great rural blues singer to record, would sing in the 1920s; Joe Ely would rock the same line in the 1980s, and in both cases the image would overpower the song and the singers would have to wail a mystery that included sex but was more than sex. Willie Dixon would write Voodoo lyrics that Muddy Waters would make famous; the old blues singer, Victoria Spivey, when she formed her own small record label in the 1960s, would use for her logo a woman dancing with a snake. In the late 1970s Irma Thomas, the New Orleans singer, would record a tune called "Princess Lala" — based on Lala, a famous Voodoo queen in the New Orleans of the 1930s and 1940s — with by all accounts a fairly accurate Voodoo practice described in the lyric. And there would be Voodoo rumors all along: that Buddy Bolden's eventual insanity was a hex (though a man through whom so much numinous force was pouring might well break under the pressure after a few years); that Robert Johnson, the great blues player of the 1930s whose style and rhythms were a direct source for rock'n'roll, sold his soul to the Devil to play and sing like he did, and that he was done in by Voodoo; and the mourners at Jelly Roll Morton's grave would say that his godmother, Eulalie Echo, a queen of Storyville, had sold his soul for her power when she was young and ruined his chance for happiness (though he had plenty of soul to play with — nobody ever played with more — for forty years). These are serious people saying these things, and it would be unwise to discount them out of hand. If you *think* your soul's been sold to the Devil, that could profoundly change your life, whether or not "soul" or "Devil" or a process of exchange exist.

Black Beauty, White Heat

Jelly Roll Morton (far left)



Ragtime

Scott Joplin

Muddy Waters

The Devil's Music

But we are interested here in how the metaphysics lived on in the music, not the practices, now, by what evidence there is, mostly degenerated from transcendence to sorcery. These Voodoo nuances linger as a kind of coda to the direct influence of indigenous African religion on American culture. From here, the African metaphysic will be felt all in the music, all in the body, its direct lineage to Africa a thing of the past.

THE HISTORIES of jazz and rock'n'roll are usually considered separately, yet when taken together they tell a very different story. It is the story of how the American sense of the body changed and deepened in the twentieth century — how Americans began the slow, painful process, still barely started now, of transcending the mind-body split they'd inherited from European culture.

Much of what would be unique to the twentieth century appeared in its first few years. Around 1895 Buddy Bolden played the first jazz. In 1899 Freud published *The Interpretation of Dreams* and Scott Joplin wrote "Maple Leaf Rag." In 1901 Marconi received radio signals from across the Atlantic. In 1903 the first feature film was shown in New York; Detroit had become the center for the automobile invention that had grown through the 1890s; the Wright Brothers took their first flight; and Marie and Pierre Curie were awarded the Nobel Prize for their work with radium, and their theories of radioactivity. In 1905 Einstein published his special theory of relativity. And Edison's electric light had been around for twenty years, though it would be another twenty before it began to be applied on a large scale. A tremendous energy was felt in the air, especially in the United States. No culture had ever been assaulted by such radical changes in so short a period, not before or since (for all the changes since have simply been extensions of these). Freud, Marconi, Edison, the Curies, and Einstein were demolishing the mechanical, linear outlook that had been Western thought for 500 years.

Henry Adams felt this with more clarity than anyone else of his time. Writing in 1906 in *The Education of Henry Adams* he said, "Evidently the new American would need to think in contradictions, and instead of Kant's famous four antimonies, the universe would know no law that could not be proved by its anti-law."

Most people felt the changes inarticulately but no less profoundly. The very *air* of daily life was changing. This was not the pastoral time our conservatives would like to imagine it was. Children by the thousands were being worked mercilessly as virtual slave labor. Six- and seven-day work weeks, twelve-hour days, no benefits, and nominal pay were taken for granted by most people — a situation kept constant by a continual flow of desperate immigrants who needed any work they could get. The white middle class was rising on their backs, and

each immigrant wave strove to rise on the backs of the wave that followed it. When we look at the silent films of that time, especially the documentary footage, the flickering fast-speed gestures of the people seem peculiarly appropriate. They felt that their world was speeding up under them like a treadmill going out of control, and they raced in jerky awkward strides to keep up. Adams's description of New York in 1905 is only one of many of its kind by travelers in that America: "The outline of the city became frantic in its effort to explain something that defied meaning. Power seemed to have outgrown its servitude and exerted its freedom. The cylinder had exploded, and thrown great masses of stone and steam against the sky. The city had the air of movement and hysteria, and the citizens were crying, in every accent of anger and alarm, that the new forces must at any cost be brought under control. Prosperity never before imagined, speed never reached by anything but a meteor, had made the world irritable, nervous, querulous, unreasonable and afraid."

The description serves our year as well as his, but that just underscores how frightening it must have been to a world not yet used to being so frightened. We have a pretty good idea why we're afraid, by now. Their fear was much more instinctive, much less clear, and so it must have been even more disorienting in many ways than ours. Seen this way, it becomes less surprising that, only nine years after Adams's description, the world, unable to stand it anymore, exploded into the worst conflagration it had ever known — a slaughter so out of proportion to its rather trivial causes that it staggers the senses. Frightened people slaying frightened people in a mad fever to release the tension, and we have been doing it ever since, in a century that seems to begin and end every day.

For most people of the time, most Western music — highbrow and lowbrow — could neither express nor release that tension. Even the greatest Western music, on the order of Bach and Mozart and Beethoven, was spiritual rather than physical. The mind-body split that defined Western culture was in its music as well. When you felt transported by Mozart or Brahms, it wasn't your body that was transported. The sensation often described is a body yearning to follow where its spirit has gone — the sense of a body being tugged upward, rising a little where you sit. And you almost always sit. And, for the most part, you sit comparatively still. The music doesn't change your body.

The classical dance that grew from this music had a stiff, straight back and moved in almost geometrical lines. The folk dances of the West were also physically contained, with linear gestures. The feet might move with wonderful flurries and intricate precision, but the hips and the spine were kept rigid. That way, the energy that lived in the hips and the loins would proceed through proper channels — and those channels were defined well outside the dance. Western movement and music were as linear as its thought.

In 1899, Scott Joplin's "Maple Leaf Rag" swept the United States. Joplin was working out of the "sporting houses" in Sedalia and St. Louis, Missouri, and his rag was influenced by the blues, by Sousa marches, by European music, and by the sounds from New Orleans. Hectic but well-formed, it contained both the frantic air of the new and the poise of the old, as most good ragtime did during the next twenty years of the form's popularity. Joplin's piece perfectly suited both the instincts and the hesitations of his time. Respectable orchestras like John Philip Sousa's could record rags and remain respectable. The dances ragtime inspired were wilder than most dances had been but still had decorum. The twentieth century could be admitted without necessarily being joined. The great beauty of Joplin's music is how his sadness flows over the beat. A grief lives in his sounds: never defiant, like the blues; almost defeated, but profound. In the slower pieces it is, for me, very like the tone of Henry Adams's prose.

Music that had been listened to for generations was overwhelmed by Joplin's, because people needed a music that was both satisfying in itself and a way of experiencing their time — especially as even the best verbal ways had been outstripped. There was very little of the African metaphysic in Joplin's music, at least as compared to New Orleans jazz, but it cultivated the public's receptivity to that metaphysic.

That metaphysic continued "underground," as far as mainstream culture was concerned, until 1917, when some Italian-Americans from New Orleans calling themselves the Original Dixieland Jass Band, and claiming to have invented the music themselves, recorded "Livery Stable Blues" and The Original Dixieland One-Step." The world had gone mad, madder than anyone had ever thought it could, and ragtime was too mannerly to handle it. The ODJB's records were wild. They're still wild. With none of the musicianship, depth, or suppleness of the black New Orleans players who would have to wait another six years to record, the ODJB yet had a sound that pulled out all the stops. Every instrument is playing at once, full speed ahead, over a pounding drum. It's a giddy music, barely under control, and there's no way to dance to it but to wiggle your legs and flail your arms. Decorum is no longer important and no longer possible.

Their records sold in the millions, in numbers that would have made them superhits even in today's vastly larger market. The numbers were unheard-of then. Nearly everyone who owned a Victrola must have owned an ODJB record. What a desperate way for a still-Victorian people to behave. What a need gaped under their giddiness. In the war, bodies were being fed into a bloody maw. In the living rooms back home, bodies were being coaxed to imitate the world's hysteria. In that imitation must have been some solace. The body, long forgotten, was chasing wildly after the mind.

By 1918 black bands, mostly migrated from New Orleans after the closing of Storyville the previous year, were playing in the influential night spots of

The Original Dixieland Jazz Band certainly wasn't the original, nor did they invent the blues as they claimed, but they did open the way in 1917-1918 for white acceptance of black music that had previously been considered too low-life.

Stompin' at the Savoy, the famous New York ballroom that held several thousand dancers, many of them white "tourists." The music at the Savoy, Cotton Club and similar halls encouraged uninhibited body-wracking dancing in a seething, exciting atmosphere.

Black Beauty, White Heat (all photos this page)

Chicago and New York. From 1923, they recorded. We take for granted now that this was called the "jazz age" — a word most Americans hadn't heard before 1917. The image of upper-crust college students in raccoon coats dancing the Charleston to a Dixieland band is a cliche for us. We take for granted that Al Jolson, the first great American pop star, sang in black face, in black style, and danced with black moves. We take for granted that black tap dancing, as soon as it was widely seen, became *the* dance form of American show business. Minstrel shows in blackface had been a staple of American culture for a long time, but they had not saturated the culture. But now, here was this thing called jazz, and people seemed to need it.

Within six years of the ODJB's first recordings, and a little more than twenty years after Joplin's first published rag, American popular culture had gone black — in its music, in its dance, in its fashions, in its language, in virtually everything but its imagery which, except for blackface, remained whiter than ever. On the screen, blacks were ridiculed and worse. Offscreen, they were (and are) slavishly imitated. It's no coincidence that the same years saw the fierce resurrection of the Ku Klux Klan, inspired by D. W. Griffith's 1915 film *The Birth of a Nation,* and that in 1919 northern cities saw their first race riots (described powerfully in James T. Farrell's novel *Studs Lonigan*). America was at war with itself as it had not been since 1865. What the body heard and felt was good, and the nation couldn't get enough of it. But Euro-American thought and values couldn't handle it, much less honor it. In social terms whites projected the mind-body split onto the whole country.

Whites were the mind, blacks were the body. Blacks were supposed to be incredibly potent, incredibly sexy, incredibly tough, and they had the infamous "natural sense of rhythm" — everything whites wanted and missed in their bodies was projected onto blacks. Christianism had always despised the body, and so most of its people despised blacks.

On the one hand, these are crude generalities. On the other hand, the realities they express are no less crude. James Baldwin puts it this way: "The root of the white man's hatred is terror, a bottomless and nameless terror, which focuses on the black, surfacing, and concentrating on this dead figure, an entity which lives only in his mind." Bottomless, yes, but perhaps not so nameless. It is the Christianist terror of having a body at all. The terror of that body's Original Sin, the terror of that body's death, the revulsion at that body's needs and functions, and the terror that one's very soul will be judged by how much control one was able to exert upon this filthy

and insistent body. It is a terror expressed in every facet of Western life, a terror compacted into a tension beyond endurance, a tension that gave Western man the need to control every body he found — and he thanked his furious God that found black bodies, because they were the screen on which he could project everything he feared and hated about his own. This is what made slavery so *appealing.* All that buying of bodies, coveting of bodies, putting bodies up on the block, comparing them, assessing them, owning them — here at last the body could be both reviled and controlled.

Of course, all of this had been around before the jazz age. But the heightened virulence of racism during this time has to be seen as a reaction to the sudden leap of black culture into such a central place in American life, becoming and remaining its dominant musical expression. This event brought to surface all our most dread diseases, all our most feared contradictions.

This was the first necessary step in a process of healing that has been taking place at the deepest levels of our culture ever since, and that continues its difficult way even as we speak. It is the great strength of this music that it has been able both to reveal the disease and to further its healing. And the disease, again and again, whether manifesting itself as racism or as an armaments race, is the Western divorce of consciousness from flesh. "In the beginning was the Word," I think therefore I am." The Second Coming will appear and the whore of Babylon (the body) will be dismembered by God. Every day even the most inarticulate among us live this out. And every day the very same people seek not to live it out, or why would so many fixate on a music, surround themselves with a music, in which lives a metaphysic that sees the body as *embodied,* as empowered, with numinous force?

By 1930, African rhythm — not African beats, but European beats transformed by the African — had entered American life to stay. Which is to say, the *technical language* and the *technique* of African metaphysics was a language we were all beginning, wordlessly, to know. America was excited by it. America was moving to it. America was resisting it. American intellectuals were pooh-poohing it. But the dialectic had been joined.

In the thirties and on into the forties, big-band jazz would be the dominant form, both commercially and, for a time, creatively. In Count Basie's band and Jay McShann's, Duke Ellington's and Earl Hines's and Benny Goodman's, many of the solists who were moving toward modern jazz, *mental* jazz, earned their living, deepened their art, and did some of their best work. But another tradition was going on at the same time that would be at least as important, and again it was going on among the poorest blacks, and again it was a matter of dancing.

This was the blues that was being played in small cramped shacks — honky tonks, juke joints, barrel houses — at the edge of nearly every small town in the South, west into Texas, and north to Chicago.

When white intellectuals started to discover rural blues in significant numbers, in the late fifties and early sixties, they were discovering it out of context. On records or in "folk music" settings, for them, it was strictly a music to be listened to. In the joints where it was played in its heyday, it was a dancing music. Sometimes it was a piano, sometimes a combination of instruments, and often just one man with a guitar, but people came to mingle, to gamble, and to dance. The relationship of music to dancer was exactly the same as the relation of drummer to dancer in Haitian Voodoo, where a drummer worked closely with the dancer and could often evoke possession at will. Texas barrelhouse piano player Robert Shaw put it this way much later: "When you listen to what I'm playing, you got to see in your mind all them gals out there swinging their butts and getting the mens excited. Otherwise you ain't got this music rightly understood. I could sit there and throw my hands down and make them gals do anything. I told them when to shake it and when to hold it back. That's what this music is for."

Music historians have usually treated jazz separately from the stream that combines blues, rhythm and blues, and rock'n'roll, so they've failed to see the full scope of what happened musically in the years after the Second World War. In jazz, the big bands faded quickly after the war was over. There were no longer millions of lonely boys to be entertained everywhere, so the big bands became too costly to keep up. Only the most famous survived, and not in the manner to which they'd been accustomed. Radio and jukebox fare thinned as a result. It was mostly insipid show music now, not the full-bodied jazz people had danced to so furiously during the war. At the same time, the new jazz of Charlie Parker, Thelonious Monk, and their cohorts, was a complex, intense music that was listened to, not danced to — the first African or African-influenced music ever primarily for listening. In this sense (and in this sense alone) it was as non-African as Mozart. Yet, unlike European music, rhythm was its core; melody and harmony were played almost as an aspect of rhythm. Many melodies, and virtually all the improvisation that made up the body of the music, were generated by the rhythm. It was as though the African metaphysic, in order to continue itself, now needed to meditate upon itself — to explore its own complexities in a way that the religious music of Africa could not do (it hadn't developed forms with which to meditate upon *itself,* as Western music had, and this was what jazz was now doing). In modern jazz more than in any previous form, improvisation would take the role that possession by the god had once taken, solos would be longer, more intricate, and less and less dependent upon laws of harmony and melody — a true entering into, and remaining in, another state of being, and *thinking* musically within that state. By the early sixties artists like Cecil Taylor and John Coltrane would be openly insisting that such meditation was precisely the object of their music.

To play for dancing was to focus on the listener;

in this new jazz, for the first time, the focus was entirely on the musician. Ideally, the listener listened intently enough to join the improviser's trance. That was understood as the listener's job, the listener's act of creation. This made possible a depth of thought — thought expressed musically but thought nonetheless — fully the equal of European musical thought, but with the intensity, the rhythm and the constellation of meanings that had come out of Africa; and the "subject matter" was purely twentieth century. I submit that if you want a commentary on, say, James Hillman's book *The Dream and the Underworld,* listen to Cecil Taylor's *Live in the Black Forest,* Miles Davis's *In a Silent Way* or *Bitches' Brew,* Charles Mingus's *The Black Saint and the Sinner Lady.* Conversely, if you want to delve into that music verbally, even interpretatively, read Hillman's book. Ornette Coleman and R. D. Laing, Rahsaan Roland Kirk and Joseph Chilton Pearce, Charles Mingus and William Irwin Thompson, Thelonious Monk and Robert Bly are brothers, dealing with the same subject matter in different mediums.

But these musicians paid a price for the tremendous concentration they achieved. They had largely left the dance behind. And, leaving the dance behind, they'd left the dancers. Not the dancing artists, who spent all their energies on their dances, but the rest of us, who, both knowingly and unconsciously, were still yearning for the dance to take us up and return our bodies to our hungering spirits. So it is no coincidence that the very same years — the mid-forties — that modern, mental jazz first got recorded were the years that rhythm and blues made its appearance. The dance *would be danced.* It would not be denied or stopped. It seemed to have a will of its own.

People who complain that amplified music is showbiz hype overlook the fact that the first musicians to start playing electrically amplified instruments regularly were backwoods, rural-blues players. Arthur "Big Boy" Crudup was the first to accompany his singing on electric guitar for a record, in 1942. Over the next several years he made very popular "race" records, doing electrically the rhythms and feels that Robert Johnson had recorded acoustically in 1936. (In 1954, Elvis Presley's first recordings would be Big Boy Crudup numbers, often imitating Crudup's delivery note-for-note.) Sonny Boy Williamson, Professor Longhair, Pete Johnson, Big Joe Turner, Muddy Waters, Willie Dixon, Little Walter, and Clifton Chenier, among others, would by the late forties have created the lineup that would be a rock'n'roll band: electric guitar, drums, bass, harmonica and/or saxophone, and occasionally a piano. Those men made a wild, haunting music — the long snake moaning plain.

Theirs was the music, in those little sweaty juke joints, that Elvis Presley, Jerry Lee Lewis and Carl Perkins, among others, sneaked off to hear when they hit their teens in the late forties. These and the others who would first play what came to be known as rock'n'roll were claimed by this music, this insistence by the dance itself that it would survive.

"Best music in the world," Lewis would say later. "Wilder than *my* music."

These young white men were living more primitively than most people can imagine now. The main street of Lewis's hometown of Ferriday, Louisiana, wasn't paved till 1951; and he didn't live in a house with electricity and running water till he began to sell records in 1957. These young men attached themselves to this music against redneck strictures that we tend to brush aside now, but which took no small courage to transgress then. They had all been raised to think this was the Devil's music, and they pretty much believed that. They had all been raised to be deeply bigoted, and they believed in that too. Yet they sat at the feet of blacks whom they wouldn't sit with at a lunch counter, because they couldn't get enough of black music. Most of them never reconciled these contradictions in their personal lives, yet that didn't stop them from transmitting the raw elements of the music to white people with a force, and on a scale, that any sane person would have thought unimaginable before Elvis had his first number one record in 1956.

Stating it with no holds barred: the moment this black music attracted these white musicians was one of the most important moments in modern history.

HOW TYPICAL that the best writers on these men — see Greil Marcus's crucial chapters on Elvis Presley in his superb *Mystery Train,* and Nick Tosches's biography of Jerry Lee Lewis, *Hellfire* — virtually ignore the importance of how these men *moved.* Elvis's singing was so extraordinary because you could *hear* the moves, infer the moves, in his singing. No white man and few blacks had ever sung so completely with the whole body.

Elvis before the Army, before 1959, was something truly extraordinary: a white man who seemed, to the rest of us, to appear out of nowhere with moves that most white people had never imagined, let alone seen. His legs weren't solidly planted then, as they would be years later. They were always in motion. Often he'd rise on his toes, seem on the verge of some impossible groin-propelled leap, then twist, shimmy, dip, and shake in some direction you wouldn't have expected. You *never* expected it. Every inflection of voice was matched, accented, *harmonized* by an inflection of muscle. As though the voice couldn't sing unless the body moved. It was so palpably a unit that it came across on his recordings. Presley's moves were body-shouts, and the way our ears heard his voice our bodies heard his body. Girls instantly understood it and went nuts screaming for more. Boys instantly understood it and started dancing by themselves in front of their mirrors in imitation of him.

Nobody had ever seen a white boy move like that. He was a flesh-and-blood rent in white reality. A gash in the nature of Western things. Through him, or through his image, a whole culture started to pass

from its most strictured, fearful years to our unpredictably fermentive age — a jangled, discordant feeling, at once ultramodern and primitive, modes which have blended to become the mood of our time.

It is not too much to say that, for a short time, Elvis was our "Teacher" in the most profound, Eastern sense of that word. This is especially so when one recalls this Sufi maxim: "People think that a Teacher should show miracles and manifest illumination. The requirement of a Teacher is, however, only that he should possess all that the disciple needs at that moment in time."

Blacks pretty much ignored him — they knew precisely where he was coming from (he was coming from them) and they didn't need to be told what he was saying, it was all around them and always had been. As for white mainstream culture — nobody knew what to do. An official culture that had become an official culture through the act of separating one thing from another (instead of unifying them), couldn't then process Elvis or the rock'n'roll, black and white, that he was forcing on them. Yet Elvis was the first product of African metaphysics in America which the *official* culture could not ignore. The various American establishments — political, intellectual, media — had successfully ignored American music since Buddy Bolden (who was only mentioned in a newspaper once in his life, when he was arrested during what we might now call his first nervous breakdown). But they couldn't ignore Elvis. And they weren't going to be able to ignore American music ever again. They could co-opt Elvis, as they finally did, but they couldn't rationalize him. And they couldn't stop him. Within months of his first hit, black artists as wild as Little Richard, Fats Domino, and Chuck Berry would be heard on white radio-stations for the first time, due to the demand Elvis had created for their music.

It is important to recognize that when whites started playing rock'n'roll, the whole aesthetic of Western performance changed. Wrote Alfred Metraux of Haitian Voodoo dancing: "Spurred by the god within him, the devotee . . . throws himself into a series of brilliant improvisations and shows a suppleness, a grace and imagination which often did not seem possible. The audience is not taken in: it is to the *loa* and not the loa's servant that their admiration goes out."

In American culture we've mistaken the loa's servant for the loa, the horse for the rider, but only on the surface. We may have worshiped the horse, the singer-dancer, but we did so because we felt the presence of the rider, the spirit. John Sebastian of the Lovin' Spoonful said it succinctly in one of his lyrics:

"No white man and few black had ever sung so completely with the whole body." Young people drawn to Elvis's style began to see themselves as a group for the first time, and soon became a potent social force against obsolete social institutions.

This Fabulous Century 1950 — 1960

And we'll go dancin'
And then you'll see
That the magic's in the music
And the music's in me

The Voodoo rite of possession by the god *became the standard of American performance in rock'n' roll.* Elvis Presley, Little Richard, Jerry Lee Lewis, James Brown, Janis Joplin, Tina Turner, Jim Morrison, Johnny Rotten, Prince — they let themselves be possessed not by any god they could name but by the spirit they felt in the music. Their behavior in this possession was something Western society had never before tolerated. And the way a possessed devotee in a Voodoo ceremony often will transmit his state of possession to someone else by merely touching the hand, they transmitted their possession through their voice and their dance to their audience, even through their records. We feel a charge of energy from within us, but it is felt as something infectious that we seek and catch and live. Anyone who has felt it knows it is a precious energy, and knows it has shaped them, changed them, given them moments they could not have had otherwise, moments of heightened clarity or frightening intensity or both; moments of love and bursts of release. And, perhaps most importantly, we could experience this in a medium that met the twentieth century on its own terms. So we didn't have to isolate ourselves from our century (as the "higher" art forms often demanded) in order to experience these epiphanies.

And for all this the body is the conduit. It is no coincidence that the first generation reared on rock 'n'roll is the generation to initiate the country's widespread aerobics movement. As distorted by image consciousness as that movement is, it shows a new emphasis. We feel our bodies, have an awareness of our bodies, that is new in Western culture. In the light of the music we've saturated ourselves with, this should come as no surprise.

A Whole Lotta Shakin' Goin' On with Jerry Lee Lewis, another who utterly throws himself into the song. The popularity of rock dancing has led to a new recognition of mind and body being inseparable, and a consequent interest in body conditioning.

The steady stream of mixed black and white rock records played on the major radio outlets began with Elvis Presley's "Heartbreak Hotel" in 1956. Within only two years, dancing in some neighborhoods was already going beyond the lindy, that patterned dance of our Western past. "Let your backbone slip," is how many lyrics put it. Or, as Jerry Lee Lewis instructed in the spoken riff of his classic "Whole Lotta Shakin' Goin' On":

> *Easy now . . . shake . . . ah, shake it baby . . . yeah . . . you can shake it one time for me . . . I said come on over, whole lotta shakin' goin' on . . . now let's get real low one time . . . all you gotta do is kinda stand . . . stand in one spot . . . wriggle around, just a little bit . . . that's what you got . . . whole lotta shakin' goin' on . . .*

It is not only that he's describing exactly the dance that George W. Cable and others described in Congo Square; it's that, as Lewis says, "we ain't fakin'." The measure of how much we ain't fakin' is that you can see in Maya Deren's 1949 footage of Haitian Voodoo dancers exactly the same dancing that you've seen from 1958 to the present wherever Americans (and now Europeans) dance to rock'n'roll.

Which is not to say that rock 'n'roll is Voodoo. Of course it's not. But it does preserve qualities of that African metaphysic intact so strongly that it unconsciously generates the same dances, acts as a major antidote to the mind-body split, and uses a derivative of Voodoo's techniques of possession as a source, for performers and audiences alike, of tremendous personal energy.

Texas singer and songwriter Butch Hancock comments on Presley's historic appearance on the "Ed Sullivan Show": "Yeah, that was the dance that everybody forgot. *It was that the dance was so strong that it took an entire civilization to forget it.* And ten seconds on the 'Ed Sullivan Show' to remember. That's why I've got this whole optimism about the self-correction possibility of civilization. Kings, and principalities, and churches, all their effort to make us forget the dances — and they can be blown away in an instant. We see it and say, 'Yeah — that's true.'"

Greil Marcus speaks of "the energy in popular music that usually can be substituted for vision." His book *Mystery Train* lives on that insight, and it is the single most important insight of any of this music's commentators. The tremendous energy of rock'n'roll has been so intense from its beginnings to this day that, while rarely articulating a vision for itself, it can't help but spark visions as it passes.

When Elvis Presley hit the charts in 1956 there was no such thing as a "youth market." By 1957, almost solely through the demand for his recordings, there was. It was a fundamental, structural change in American society. In a few years we would learn *how* fundamental, as that "market" revealed itself also to have qualities of a community, one that had the power to initiate far-reaching social changes that seemed unimaginable in 1955. The antiwar movement, the second wave of the civil rights movement, feminism, ecology, and the higher consciousness movement — and there was little distinction between them all when they were beginning at roughly the same time — got their impetus from the excitement of people who felt strong because they felt they were part of a national community of youth, a community that had been first defined, and then often inspired, by its affinity for this music. *That* was the public, historical result of those private

epiphanies of personal energy we'd felt through the music's form of possession.

The thread that ran through all those movements of the sixties, and continues in their derivatives now, is a fundamental challenge to the old Western split between the mind and the body. More than any other single concern, this challenge defined the *mood,* if not always the issues, of the sixties. As William Irwin Thompson once put it, "The rock music of the sixties came close to being so powerful as to uproot a whole generation from one culture and socialize it completely in the new (New Age) one." The socially furious music of the punks, the sexually explicit music of Prince and his contemporaries, carry that on. And all this was implied in the music's African roots from the beginning.

As Duke Ellington put it in his libretto to *A Drum Is Woman* (a libretto in which he makes clear that he means "a drum is a goddess"):

> *Rhythm came from Africa to America.*
> *Do you know what it does to you?*
> *Exactly what it's supposed to do.*

I haven't meant to imply that either jazz or rock 'n'roll is a greater or more socially significant music than the other. They are both faces of the same music. Within each is the holy drum. Rock takes the stand and recreates every night the terms of our survival, part ceremony, part cavalry charge. In all its genres it is Whitman's barbaric yawp amplified across the roofs of the world, making so much *possible* that had been so long lost. And it has to be done every night because, as one wise nineteen-year-old girl told me long ago, "There are things that have to be learned all over again, every night."

Jazz also must take the stand every night, recreating and regenerating its forms, but contemporary jazz comes after what's lost has been discovered again. Jazz is the subtlety of feeling, the swiftness of thought, always implicit in the true freedom that we all say we seek. It's the suppleness of existence itself. It is change itself, flux itself, and the intelligence that seeks both to remain true to its source and to change. Even jazz at its wildest suggests a focused inner meditation that rock knows nothing about. Jazz mothered rock, and yet rock is earlier, more primitive. If rock is ceremony, jazz is knowledge. It is the initiate's knowledge that the ceremony exists both to celebrate and, in distilled form, to preserve. We must remember Coomaraswamy's thought, that "so long as the material of folklore is transmitted, so long is the ground available on which the superstructure of full initiatory understanding can be built."

Music can be understood by the body instantly — it carries so much history within it that we don't need history to understand it. But a culture as a whole, a country as a whole, cannot be understood by the body alone — at least not any more. The history of America is, as much as it is anything, the history of the American body as it sought to unite with its spirit, with its consciousness, to heal itself and to stand against the enormous forces that work to destroy a Westerner's relationship to his, to her, own flesh. This music, largely unaware of itself; carried forward through the momentum of deeply rooted instinct; contradicting itself in many places; perverting its own purposes in many instances; sinking many times under the weight of its own intensity into a nether world of hate and confusion and bad trips; and trivializing its own meanings at many a crucial turn — this music yet rushed and rushes through every area of this country's life in an aural "great awakening" all its own, to quicken the body and excite the spirit and, quite literally, to waken the dead.

From the first the music has felt like an attack on the institutions — actual and conceptual — that it was, in fact, attacking. From the first it moaned and groaned furiously all the length of its great long snake, and has never been afraid of venting its own fury — often resulting in its own destruction. "If I told you what our music is really about we'd probably all get arrested," Bob Dylan told an interviewer in 1965. Angry enough, often enough, the music has frightened its very dancers, so that many don't want to be challenged in that way for very long and they let the music become merely a memory of their youth. But it is a music that won't stop and that will not leave us alone. It speaks through the body and invokes the spirit. And some of us have felt, since the first day we heard it, that this is the aesthetic we have to live up to. No matter how the deal goes down.

It's fitting to end with the superb New Orleans musician Sidney Bechet's definitions of the music he helped give us:

> *It's everybody's who can feel it. You're here . . . well, if there's music, you feel it — then it's yours too . . .*
>
> *Oh, I can be mean — I know that. But not to the music. That's the thing you gotta trust. You gotta mean it, and you gotta treat it gentle. The music, that's the road. There's good things alongside it, and there's miseries. You stop by the way and you can't ever be sure what you're going to find waiting. But the music itself, the road itself — there's no stopping that. It goes on all the time. It's the thing that brings you to everything else. You have to trust that. There's no one ever came back who can't tell you that.*
>
> *After emancipation . . . all those people who had been slaves, they needed the music more than ever now; it was like they were trying to find out in this music what they were supposed to do with this freedom: playing the music and listening to it — waiting for it to express what they needed to learn, once they had learned it wasn't just white people the music had to reach to, nor even to their own people, but straight out to life and to what a man does with his life when it finally* is *his.* ■

Hear That Long Snake Moan: Bibliography

The list of recordings includes several representative selections of the artists mentioned in this article and its predecessor, Part I (*WER* #54). The well-known rock'n'roll titles are not listed, as they can be found anywhere.

Adams, Henry, *The Education of Henry Adams.* (Various)

Baldwin, James. *Go Tell It on the Mountain.* New York: Dell, 1952.

Baldwin, James. *The Devil Finds Work.* New York: Dial, 1976.

Baldwin, James. *Nobody Knows My Name.* New York: Dell, 1961.

Bechet, Sidney. *Treat It Gentle.* New York: Hill & Wang, 1960.

Blesh, Rudi and Harriet Janis. *They All Played Ragtime.* New York: Oak, 1971.

Bookhardt, G. Eric and Jon Newlin. *Geopsychic Wonders of New Orleans.* New Orleans: Contemporary Arts Center, 1978.

Davis, Gerald L. *I Got the Word in Me and I Can Sing It, You Know: A Study of the Performed African-American Sermon.* University of Pennsylvania Press, 1985.

Deren, Maya. *Divine Horsemen: The Living Gods of Haiti.* New York: MacPhear and Co., 1953.

Driggs, Frank and Harris Lewine. *Black Beauty, White Heat: A Pictorial History of Classic Jazz, 1920-1950.* New York: Morrow, 1982.

Guralnick, Peter. *Feel Like Going Home: Portraits in Blues and Rock 'n'Roll.* New York: Vintage, 1981.

Hentoff, Nat and Nat Shapiro, eds. *Hear Me Talkin' to Ya.* New York: Holt, Rinehart and Winston, 1955.

Hentoff, Nat. *Jazz Is.* New York: Avon, 1976.

Hurston, Zora Neale. *Tell My Horse.* Berkeley: Turtle Island, 1983.

Lomax, Alan. *Mister Jelly Roll.* Berkeley: University of California, 1973.

MacManus, Seumas. *The Story of the Irish Race, Revised Edition.* New York: Devin-Adair, 1944.

Marcus, Greil. *Mystery Train: Images of America in Rock'n'Roll Music.* New York: Dutton, 1976.

Marquis, Donald M. *In Search of Buddy Bolden. New York: DaCapo, 1978.*

Metraux, Alfred. Voodoo in Haiti. New York: Schocken, 1972.

Oakley, Giles. *The Devil's Music: A History of the Blues.* New York: Harcourt Brace Jovanovich, 1976.

Oliver, Paul. *Songsters and Saints: Vocal Traditions on Race Records.* Cambridge: Cambridge University, 1984.

Rose, Al. *Storyville.* Alabama: University of Alabama, 1974.

Shaw, Arnold. *Honkers and Shouters: The Golden Years of Rhythm and Blues.* New York: Collier/Macmillan, 1978.

Shaw, Arnold. *Black Popular Music in America.* New York: Schirmer/Macmillan, 1986.

Smith, Michael P. *Spirit World: Pattern in the Expressive Folk Culture of Afro-American New Orleans.* New Orleans: New Orleans Urban Folk Society, 1984.

Tallant, Robert. *Voodoo in New Orleans.* New York: Macmillan, 1946.

Thompson, Robert Farris. *Flash of the Spirit.* New York: Vintage, 1984.

Tosches, Nick. *Hellfire: The Jerry Lee Lewis Story.* New York: Dell, 1982.

Turner, Frederick. *Remembering Song: Encounters With the New Orleans Jazz Tradition.* New York: Viking, 1982.

Williams, Martin. *Jazz Masters of New Orleans.* New York: Viking, 1967.

Recordings:

Coleman, Ornette. *Free Jazz.* Atlantic. 1364.

Coltrane, John. *A Love Supreme.* Impulse. A-77.

Cruddup, Arthur "Big Boy." *The Father of Rock'n'Roll.* RCA. LPV-573.

Davis, Miles. *The Complete Birth of the Cool.* Capitol. M-11026.

Davis, Miles. *Bitches' Brew.* Columbia.

Davis, Miles. *In a Silent Way.* Columbia, PC 9875.

Ellington, Duke. *A Drum Is a Woman.* Columbia, JCL-951.

Ely, Joe. *Live Shots.* MCA. 5262.

Jefferson, Blind Lemon. *Black Snake Moan.* MLP 2013.

Joplin, Scott. *16 Classic Rags, Dick Hyman, Piano.* RCA. ARL1-1257.

Kirk, Rahsaan Roland. *The Inflated Tear.* Atlantic. 90045-1.

Mingus, Charles. *Reevaluation: The Impulse Years.* Impulse. AS-9234-2.

Monk, Thelonious. *Thelonious Himself.* Riverside. RLP 12-235.

Monk, Thelonious. *Genius of Modern Music, Vol. I-II.* Blue Note, BST 81510.

Morton, Jelly Roll. *The Library of Congress Recordings, Volume Five.* Swaggie. S-1315.

Oliver, Joe. *King Oliver's Jazz Band 1923.* Swaggie. S1257.

Original Dixieland Jazz Band. *Original Dixieland Jazz Band.* RCA. 730 703/704.

Parker, Charlie. *The Very Best of Bird.* Warner Brothers. 2WB 3198.

Shaw, Robert. *Texas Barrelhouse Piano.* Arhoolie. F-1010.

Wild Tchoupitoulas. *Wild Tchoupitoulas.* Island. LPS 9360.

The Serpent and the Rainbow

"Haiti will teach you that good and evil are one. We never confuse them, nor do we keep them apart." Due mainly to prejudice and ignorance, voodoo has long been associated with "black magic" and the dark arts. But as this amazing tale reveals, the Haitian traditional religion is, for its adherents, a source of light.

In 1982, Dr. Wade Davis, an ethnobotanist from Harvard, seeking new knowledge about anesthetics, traveled to Haiti hoping to penetrate the myth-shrouded religion we call voodoo (Haitians do not call their religion by that name — to them the word refers to a specific event, a dance ritual) and to discover the ingredients of the "zombie poison" used to create "the living dead." In ***The Serpent and the Rainbow****, Dr. Davis unravels the mystery which, Castaneda-like, nearly unraveled him. Along the way he provides a brief, though excellent, history of Haiti and the slave trade, and gives etymological tracings of some of the words associated with the country's religion.*

This vivid portrait of Haitian spirituality removes much of the tarnish Hollywood has imparted to voodoo.

—Douglas Cruikshank

The Serpent and the Rainbow
Wade Davis
1985; 371 pp.
$4.95
($5.95 postpaid) from:
Warner Books
P. O. Box 690
New York, NY 10019

•

Vodoun is not an animistic religion, Max Beauvoir had told me. The believer does not endow natural objects with souls; they serve the loa, which by definition are the multiple expressions of God. There is Agwe, the spiritual sovereign of the sea, and there is Ogoun, the spirit of fire and the metallurgical elements. But there is also Erzulie, the goddess of love; Guede, the spirit of the dead; Legba, the spirit of communication between all spheres. The vodounist, in fact, honors hundreds of loa because he so sincerely recognizes all life, all material objects, and even abstract processes as the sacred expressions of God. Though God is the supreme force at the apex of the pantheon, he is distant, and it is with the loa that the Haitian interacts on a daily basis.

•

Never in the course of my travels in the Amazon had I witnessed a phenomenon as raw or powerful as the spectacle of vodoun possession that followed. The initiate, a diminutive woman, tore about the peristyle, lifting large men off the ground to swing them about like children. She grabbed a glass and tore into it with her teeth, swallowing small bits and spitting the rest onto the ground. At one point the mambo brought her a live dove; this the hounsis sacrificed by breaking its wings, then tearing the neck apart with her teeth. Apparently the spirits could be greedy, for soon two other hounsis were possessed, and for an extraordinary thirty minutes the peristyle was utter pandemonium, with the mambo racing about, spraying rum and libations of water and clairin, directing the spirits with the rhythm of her asson. The drums beat ceaselessly. Then, as suddenly as the spirits had arrived, they left, and one by one the hounsis that had been possessed collapsed deep within themselves. As the others carried their exhausted bodies back into the temple, I glanced at Beauvoir, and then back across the tables of guests. Some began nervously to applaud, others looked confused and uncertain.

El Volkswagen. Reflejo de la perfección.

El Volkswagen

If you have ever looked under the hood of a dead car and seen nothing but black boxes looking back, and realized the car would only revive after you paid some garage $50/hr, plus parts, then consider this — a brand-new car with no black boxes! Yes, just like in the old days, when men were men and cars were repaired by humans with wrenches, not electrical engineers with computers.

The car with no black boxes is a genuine VW bug, and it's made in Mexico. Trouble is, that's also where it's sold. Before we get into the challenges, let's describe the machine. Except for the turn signals in the front bumper, the car looks like a '72 bug. It has a 1600cc engine with a 6.6:1 compression ratio, allowing it to run on any gas, while putting out 44 hp. Although the price tag in pesos is changed twice a month due to the bottom having fallen out of that monetary unit, it translates into $5,000 U.S.

A few years back, gringo entrepreneurs began buying them in Mexico, federalizing them and selling them stateside. Federalizing meant bringing them up to DOT standards, including installation of seat belts, buzzers, bumper and door reinforcements, dual-reservoir master cylinder, a narrow, "unleaded" gas tank filler, plus conversion of glass and headlights and a full dose of emission-control gadgetry. No small job.

The converted bugs were selling well at $7,000, too well in fact. VW of America got perturbed by the sales figures, realizing how many unsold Rabbits they represented, and according to rumor, got the feds to clamp down so hard on the conversion process that the business gasped and died.

None of which affects Mexico, where you can buy one today, declare it at the border and post bond, then bring it up to federal snuff within 180 days. A bit of work indeed, which is why scofflaw enthusiasts are said to have bought a car, traded bumpers and added fender turn signals, then driven brazenly across the border bearing plates and registration from a $100 domestic junker.

Whether you try such outrage or not, the desire shown for the bug reflects the quality of Dr. Porsche's product — how many other cars designed in the late 1930s are still hot sellers? —Dick Fugett

National Parks Trade Journal

ZION NATIONAL PARK
(Utah)

MAILING ADDRESS:
TW Services, Inc.
451 N. Main
PO Box 400
Cedar City, UT 84720

SEASONAL EMPLOYMENT

SPRING	SUMMER	FALL	WINTER
0	200	200	0

BEST TIME TO APPLY: January thru April

GENERAL EMPLOYMENT:
■ Indicates services and facilities with employment opportunities.

■ Management	■ Administration	■ Housekeeping
■ Gift Shops	■ Front Desk	■ Tour Guides
☐ Stables	■ Maintenance	■ Grocery/Supplies
■ Food Service	■ Security	■ Garage/Gas Station
■ Janitorial	■ Gardening	■ Transportation
☐ Rental Shops	☐ x-c Skiing	☐ Alpine Skiing
☐ Climbing (Ice/Rock)	☐ Camping	☐ Boating (rafting, canoeing etc.)

ADDITIONAL INFORMATION:

EMPLOYER PROVIDED LODGING:
■ Dorms ☐ Tents ■ Cabins
☐ Other:

LODGING RESTRICTIONS:
■ Pets ☐ Guests
☐ Other:

EMPLOYEE MEAL PROGRAMS:
■ Yes ☐ No

EMPLOYEE COOKING FACILITIES:
☐ Yes ■ No

NEARBY RELIGIOUS SERVICES:
■ Yes ☐ No

NEARBY PRIVATE HOUSING:
☐ Yes ■ No

GROOMING RESTRICTIONS:
☐ Hair ☐ Moustache ■ Beard
■ Other: Neatly groomed

OFF SEASON ADDRESS:
Same as above

This book is where you find out about seasonal work in a National Park. We're not talking government jobs here (though the journal does give the information necessary for those wishing to attempt the landing of a coveted Ranger position), we're talking concessionaire jobs: buspersons, waiters and waitresses, drivers, bedmakers, pool cleaners, guides, dude wranglers, gardeners. We're also talking hard work for low pay, and a room-and-board fee that tends to leave little left for busfare home. But look at where you work! I went for the bit myself:

waiter in Zion National Park. It was wonderful; I'd do it again. The ***Journal*** *gives complete information for each park, plus a bunch of enticing stories from the front lines. Hard to resist if you've that turn of mind.* —J. Baldwin

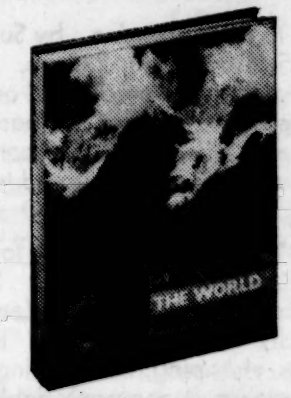
National Parks Trade Journal
Dave Anzalone, Editor
1986; 162 pp.
$8.95
postpaid from:
National Parks
Trade Journal
P. O. Box 2221
Wawona Station
Yosemite National Park,
CA 95389

Classic Walks of the World

You know the stunning blue fjord with the snowy peaks in the background that you see in tourist brochures for New Zealand? Or that tiny dirt track — barely a goat trail — winding across photographs of Mont Blanc? This book tells you where those trails are, and what they're like day by day — seventeen of 'em described and illustrated in detail. Some are only for experts in good condition and equipped with nerves of steel. Others are accessible to families with little kids. All are the sort of thing that makes life worth living. What a life it would be to hike them all! Hmmm . . . Wonder how much that'd cost?

—J. Baldwin

Classic Walks of the World
Walt Unsworth, Editor
1985; 160 pp.
$14.95
($15.95 postpaid) from:
Interbook, Inc.
14895 E. 14th Street
Suite 370
San Leandro, CA 94577
or Whole Earth Access



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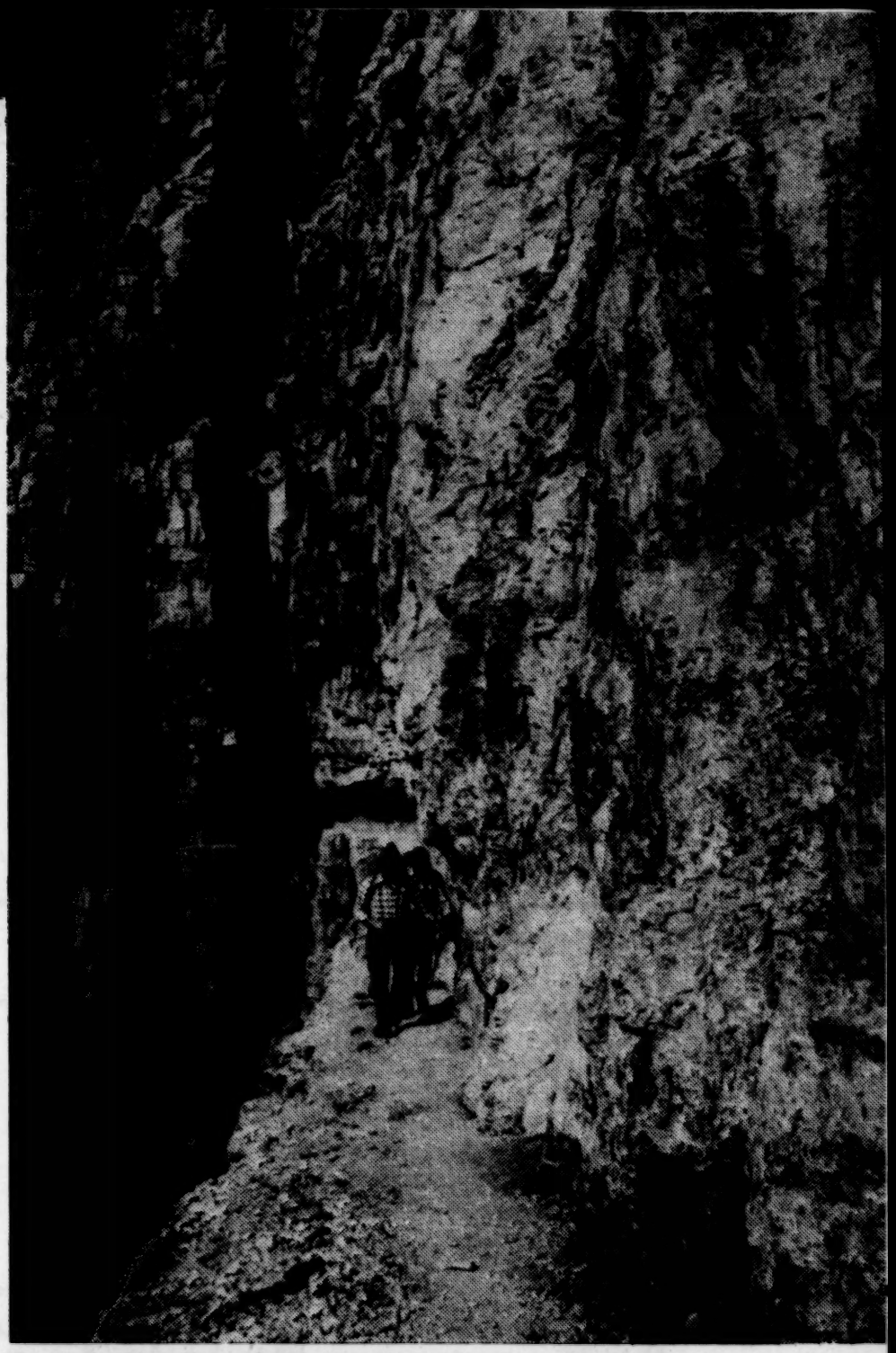
Before long, you reach a comfortable ledge equipped with a cable, which leads across the sheer face of the Torre and round the corner. For the first time you are on the eastern side of the range, with views across to the Adige and the distant Dolomites. The more immediate circumstances are sensationally exposed: here indeed is the 'fly on the wall' syndrome so often experienced by rock climbers but seldom by walkers — and never like this! But it is safe enough: the ledge is quite broad (seldom less than a metre) and there is a good cable for its whole length.

It is the beginning of a remarkable traverse, unparalleled in the Alps. For a long way the route is virtually level, across the red and grey limestone walls of the Torre di Brenta, the Sfulmini, the Campanile Alto, to the little shattered rock tower of Sentinella where a delicate descending scramble is made down to the foot of the Campanile Basso — the famous 'Guglia di Brenta'. This celebrated tower of rock has been in view for some time before you actually reach it: it acts like a magnet, drawing you steadily on, fascinated by its impossible shape. •



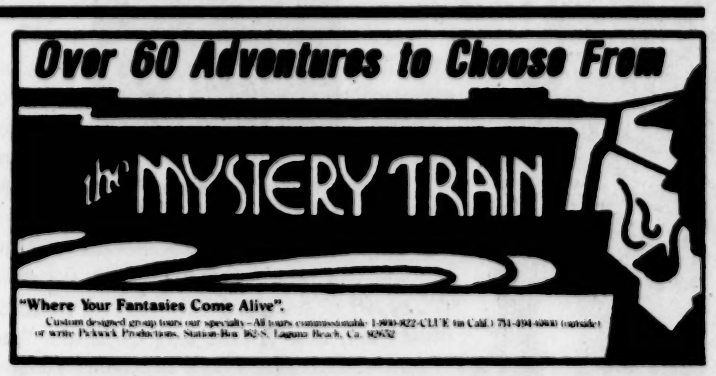
The steel cables adorning the ledges of a *via ferrata* are not there simply as handrails. They are intended to be used for self protection in the event of a slip.

Specialty Travel Index

These aren't the trips you usually see on your travel agent's wall; these are roads less traveled, roads bizarre. Thousands of them, listed by interest and location, each with a brief but not necessarily unbiased description (though I checked a few entries I was familiar with and the descriptions were true enough). Lemme see . . . let's try ballooning in, say, Kenya. It's there. Item #66. The variety is amazing: art tours, tours that follow major auto races, antique fairs, music festivals — the list is long and very likely to cause your fidgety foot to fidget at a higher hertz. I've never seen so much temptation in one place.

—J. Baldwin

Specialty Travel Index
Andy Alpine and
C. Steen Hansen, Editors
$5/year
(2 issues) from:
Specialty Travel Index
305 San Anselmo
Avenue #217
San Anselmo, CA 94960



Balloon safaris LTD

Zebras By Balloon

Let us take you on a unique adventure – a lighter-than-air safari over the Masai Mara Game Reserve. The mara country is famous for its large herds of buffalo, prides of lion, and for the vast concentrations of wildebeest that migrate through from the Serengeti plains every year. With its magnificent wildlife and gentle rolling scenery, it is the finest place on earth to go ballooning – and we have several balloons ready to take you on the trip of a lifetime.

The flight is at low level and lasts about an hour, giving plenty of time to see and photograph a variety of animals. After landing there is a champagne and chicken picnic, while the ground crew, who have followed by landrover, pack up the balloon. There is then a game drive back to the lodge, arriving in time for morning coffee or tea. It is most convenient if you stay at Keekorok Lodge, but the short drive from the other lodges or camp sites in the area is well worth it – for the most original safari in Africa.

Cost per person is Kenya Shillings 3600, all inclusive.

Contact: BALLOON SAFARIS LTD., Box 475571, Nairobi, Kenya. Tel: 335807. Telex: BLOCOTELS 22146.

Banana Republic Travel Bookstore
Catalog **free** from:
Banana Republic
Box 7737
San Francisco, CA 94120

Banana Republic Travel Bookstore

A perfect job. This is one of the few mail-order catalogs recommendable as a book. The pithy one-sentence reviews, astute selection, and eclectic range of books make this a fine survey instrument whether or not you order anything. The categories offered are Africa, The Americas, Asia, Europe, The Pacific, and Global Perspectives. No one sustains bemused tone-of-voice like Banana Republic.
—Stewart Brand
[Suggested by Walt Noiseux]

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"I thought for some reason even then of Africa, not a particular place, but a shape, a strangeness, a wanting to know. The unconscious mind is often sentimental; I have written 'a shape,' and the shape, of course, is roughly that of the human heart." —Graham Greene

•

AA Book of Country Walks $29.95 (7291-85). Unpaginated. A treat for pedestrians from Britain's Automobile Association: more than 200 wonderful walks, mostly three to six miles long, splendidly presented. Each route is outlined on a single page that slips out of the three-ring binder and into a transparent envelope for easy carrying. As a bonus, there's a field guide to the flora and fauna along the path.

•

Born to Shop: London by Susan Schneider Thomas. $5.95 (810012-86). 232 pp.
One of a series predicated on the idea that a good shopping experience compares favorably with a significant religious or sexual experience. De rigueur for serious shoppers. Designed to fit into a pocket.

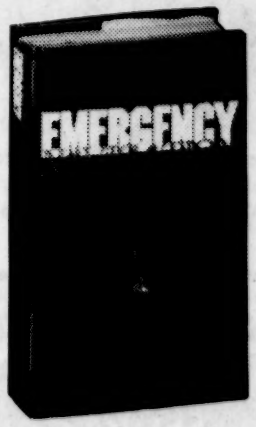
•

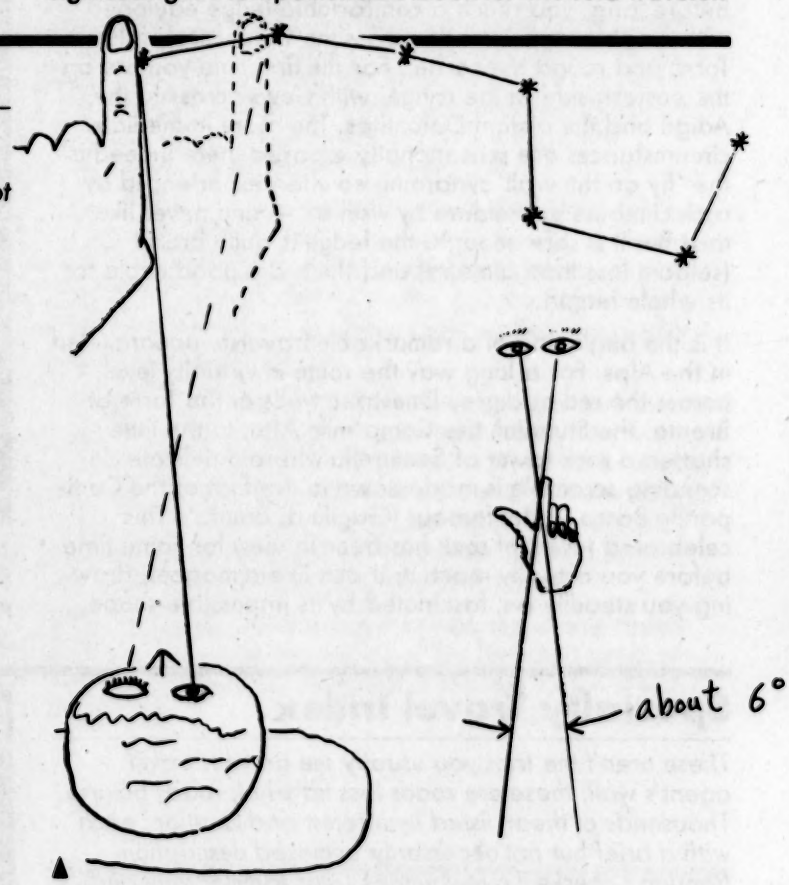
The Woman's Travel Guide to New Zealand
By Elizabeth Hansen. $9.95 (840006-86), 159 pp.
Not for nothing are New Zealanders called Kiwis — friendly, unassuming birds. The author's particular slant: sports, shopping, barhopping, eating alone. Also straight sightseeing. A companionable book for the solo traveler.

Emergency Navigation

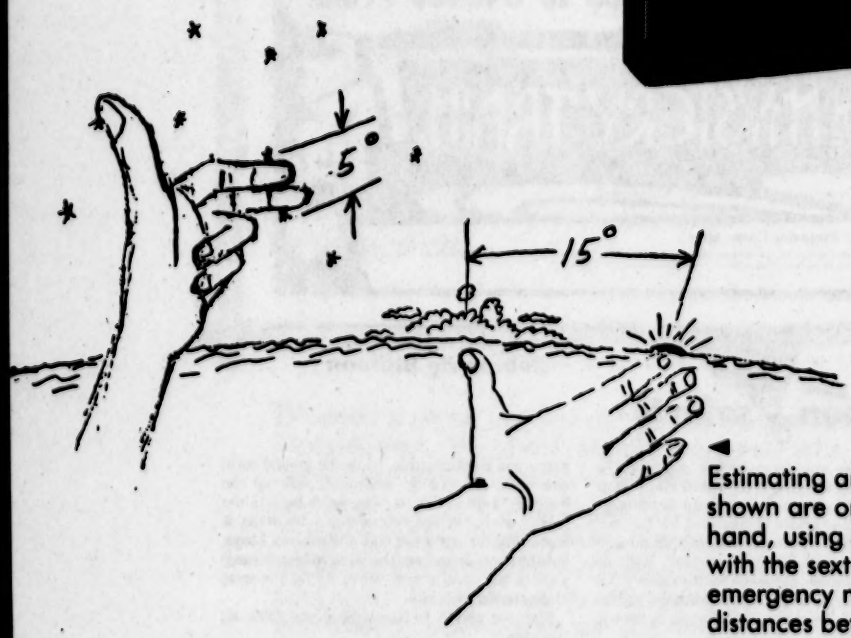
How to find your way without compass, sextant, or electronics, if you have to. Not your everyday situation, admittedly. But the book held me fascinated nonetheless, not because I expect to be halfway to Fiji and have a shark eat my compass, but because the procedure greatly increased my comprehension of what navigation is all about. Lots of rules of thumb here, including a few that actually use your thumb. *—J. Baldwin*

Emergency Navigation
David Burch
1986; 248 pp.
$24.95
($27.95 postpaid) from:
International Marine Publishing Company
21 Elm Street
Camden, ME 04843





▲ "Winking" your finger at arm's length to measure angles. If you hold your finger in line with one star of a pair, and then change eyes, and your finger moves to the other star, the two stars are about 6° apart. If your finger only moves halfway to the other star, the stars are about 12° apart. Calibrate your wink using known star pairs or using a sextant and distant landmarks. A typical "wink" is about 6°. Winking a kamal edge is easier and more accurate than winking your finger.



◀ Estimating angles with the hand and fingers at arm's length. The angle sizes shown are only rough averages. With a sextant available, "calibrate" your own hand, using angular distances between distant landmarks that you measured with the sextant. Skill at angle measurements with your hands is a big asset in emergency navigation. Similar calibrations can be made at sea using the distances between low stars, but check that the eye-to-hand length is the same when looking up and looking toward the horizon. If this length changes, the angle calibration changes.

Hypothermia, Frostbite and Other Cold Injuries

At last, a cold-injury book that edges into M.D. territory — necessary if effective first aid is to be administered immediately in the field. This unusual breach of doctors' secrets comes as an awful truth has become apparent: traditional first aid is often the cause of death when the patient is nearly frozen. (Turns out you can't even move a cold victim without risk of lethal heart failure.) There's a good chapter on immersion hypothermia, as occurs when one falls out of the boat. Like the ability to swim, this information should be part of anyone's education.

—J. Baldwin

Hypothermia, Frostbite and Other Cold Injuries
James A. Wilkerson, M.D., Editor
1986; 114 pp.
$8.95
postpaid from:
The Mountaineers Books
306 2nd Avenue W.
Seattle, WA 98119

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Sudden death has been observed when victims of profound hypothermia lie still — or float — for prolonged periods and then physically exert themselves. This complication has been encountered most commonly in victims of cold water immersion who have started swimming to reach a rescue boat or have tried to pull themselves into the boat.

To avoid this lethal complication, the victim of profound hypothermia must never exert himself. He must not walk, climb, swim, or even move when lifted. If the victim is in cold water, he must not try to climb into the boat, but should allow himself to be carefully and gently lifted from the water. Similarly, the rescuers should avoid pumping venous blood into the central circulation by minimizing their manipulation of the victim's extremities. Some authorities have recommended that wet trousers not be removed for this reason.

H.E.L.P. (Heat Escape Lessening Posture).

Swimming

The heat produced by physical activity is known to play a major role in maintaining body temperature in cold air. Is the same true for accidental cold water immersion? Can a strong swimmer power his way out of trouble through muscular activities that produce heat faster than shivering? The answer is No! — absolutely and unequivocally!

In cold water physical activity increases heat loss more than it increases heat production. Activities such as swimming accelerate the core cooling rate by thirty-five to fifty percent, particularly in water colder than 60° F (15° C). Physical activity forces water through clothing and around the body, thereby accelerating heat loss by convection. More importantly, physical activity stimulates blood circulation to the body's periphery, particularly the muscles of the arms and legs, in the process greatly reducing its primary defense mechanism against cold water — an outer shell of cold tissue which acts as insulation for the core.

•

The thermal benefit of strategies for reducing the exposed surface area may be relatively small but can result in an extra thirty to sixty minutes of survival, which may be critical for rescue.

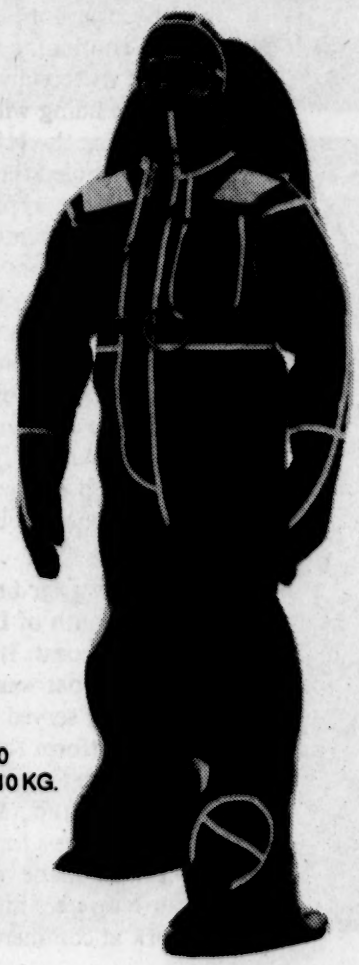
Huddle

The Huddle: another method for reducing the body surface area exposed to cold water.

Bayley Cold Water Immersion Suit

In the old days, fishermen in cold northern waters often didn't even bother to learn to swim. Death from hypothermia was a constant risk and fishing was an extremely dangerous business. There is good reason for all those old sea chanteys and dirges. Eventually people realized that the insulated suits that kept scuba divers comfortable below the water could keep sailors alive and floating on the surface. These survival suits are the result and today there are at least 14 manufacturers worldwide. Early models were heavy and very clunky. While this is not an outfit to tapdance in, the BayleySuit weighs just nine pounds, can be donned in less than a minute and will make you sweat profusely unless you happen to be in 35° water, in which case it will keep you afloat and alive until rescue. Fishermen report climbing into these suits when encountering rough seas and simply keeping them on until the storm passes. The BayleySuit comes in five sizes to fit any body from a 3'6", 44-pound child to a 6'8", 350-pound adult.

—Richard Nilsen



Bayley Cold Water Immersion Suit
$335-$365
Information **free** from:
BayleySuit Safety
and Survival Apparel
900 S. Fortuna Boulevard
Fortuna, CA 95540

MODEL-UNIVERSAL
SIZE CATALOG NO. 9-01-00
WEIGHT RANGE - 50 to 110 KG.

THE 1½-TON OCEAN PICKUP PICKS UP

The ongoing saga of an ecologically correct technology for the Third World.

The idea: A fast, simple, inexpensive, work sailboat utilizing high-tech design and construction, yet buildable by ordinary folk, out of common woods found in less-developed countries.

The advantage: Fisherfolk being priced out of their profession by rising costs of motors, parts, fuel and fancy commercial craft can get back into the game and compete in a way that would be impossible in obsolete traditional boats, even if the big trees necessary to build them were available.

The players: John and Nancy Jack Todd, two of the founders of the famed New Alchemy Institute in Massachusetts, now heading Ocean Arks International, dedicated to encouraging ecological sustainability worldwide by introducing proven techniques where they're needed; Dick Newick, yacht designer noted for clever and speedy craft; Jim Brown, inventor of a boatmaking process dubbed Constant Camber, in which mass-produced strips of common woods are assembled with epoxy on simple molds to make hull parts without the usual hassle; various friends, funders, fisherfolk, sailors, and kin.

The boat: A 32-foot trimaran, named for benefactress Edith Muma; 1½-ton capacity, light, fast, and proven seaworthy by a stint as a trawler off Cape Cod, and then by a daring 1983 sail to Guyana for trial under real Third World conditions.

The early adventures have been extensively covered in CoEvolution Quarterly *#41. We left the* Edith Muma *in Guyana awaiting a government-sponsored order for up to 200 craft. Fisherfolk were enthusiastic; tests showed a Pickup could pay for itself in one year in fuel savings alone. For the latest chapter in this saga, we excerpt a recent letter from the Todds:*

Dear *WER* friends,

It's just another variation on the old "Technology is the answer, what was the question?" Guyanese fishermen were enthusiastic; one wanted to buy the Pickup on the spot. We found a local company that could make Pickup kits that could be assembled by smaller boatbuilders. Senior officials of the InterAmerican Development Bank offered to fund production, and the Guyanese government waxed positive. But nothing happened, despite continuing verbal assurances. A bit of detective work revealed that Guyana's siding with Nicaragua in condemning the U.S. invasion of Grenada cooled the bank's interest. It also became apparent that part of the fishermen's enthusiasm for the Pickup came from its potential for freedom. The Guyanese government controls fishing as well as the export and import of spare parts and all manner of goods by allocating fuel; no gas, you can't go far. Thus an enthusiastic letter from a Costa Rican fishing cooperative proved irresistable, and once again the *Edith Muma* went to sea.

A stormy voyage brought her to Puerto Viejo, south of Limon, on Costa Rica's east coast. It wasn't long before the boat was back at work fishing. She served best as a sort of fishing platform for as many as five men. They made pretty good money — several of them began to design smaller Pickups for their individual use. But we made a tactical error: because we were not legally permitted to work at commercial fishing, we felt that we couldn't charge the fishermen for the use of the boat. In time, we were seen as rich gringos with a wonderful toy that did not require any sort of mutual exchange. We countered this by planning to establish a boatbuilding shop where locals could build their own Pickups.

Funding support came from the Canadian International Development Agency (CIDA), but once again the timing was not on our side. Brian Mulroney had just been elected Canadian Prime Minister, and had instituted massive budget cuts. This meant low priority for projects that didn't directly benefit Canadian industries. We weren't specifically turned down, but we weren't actually funded either. We had to borrow money to pay our Costa Rican director, Luis Lepiz, and the Pickup crew who had been living hand-to-mouth for months. Then, in November of 1985, misinterpretation of a hand signal caused the *Edith Muma* to hit a reef hard enough to wreck her. The project ran aground, too.

Then in early 1986, we had some luck with funding. The Pickup's designer, Dick Newick, flew in to supervise repairs. At the same time it became clear that the social infrastructure of Costa Rica's west coast fishing economy was much better developed. Since the Pickup was already dismantled for repair, we took the opportunity to load it on a flatbed truck and haul it to a new life in the Pacific fisheries.

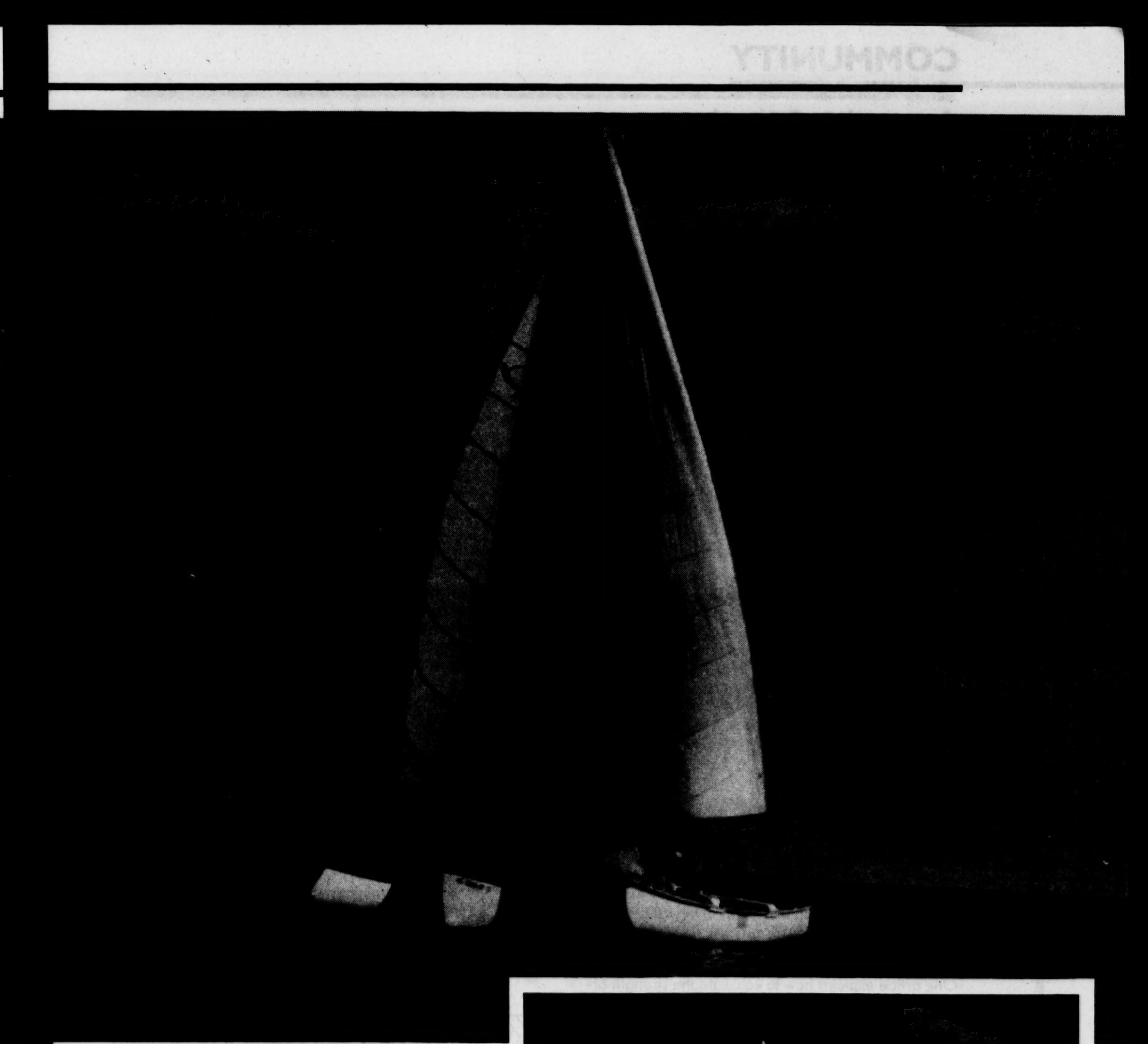
The Pickup's new home is the workshop/boatyard of Wayland and Aruna Combe-Wright, an English couple who sailed across the Atlantic in their homebuilt catamaran, *Taulua.* Dick Newick and Wayland designed, and Wayland built, a modified Lungstrom rig more suitable to the light winds of the area. The new rig is a great success. We decided to make the Combe-Wrights partners in the venture.

Wayland and Aruna built their boat of ash trees they cut, covered with a skin fashioned from paper and canvas stuck together with homemade tar. It's a synthesis of Irish coracle construction and Polynesian design. Like the *Edith Muma,* it's a craft that takes advantage of local resources. We immediately saw that future Pickups could be made in this manner rather than depending on epoxy. They will be; Wayland is setting up to build three more, and the Combe-Wrights' *Taulua* has been designated Pickup #2. The fleet grows at last.

Meantime, we are once more involved in the seemingly endless red tape that must be negotiated to make the Pickup legal.

It's been 4½ years since we launched the *Edith Muma* and proved her technology, proof once again that ecological design must take into account all aspects of a project, including the social, to make it truly useful. The voyage continues. We'll stay in touch.

—John Todd and
Nancy Jack Todd



(Above) Graceful, modified Lungstrom rig has greatly improved performance in the light winds off the Pacific coast of Costa Rica, where the Pickup is currently undergoing testing as a commercial fishing vessel.

(Right) Original gaff rig with roller-reefed jib proved effective enough to carry the Pickup from its home port on Cape Cod to Bermuda, Guyana, and finally the eastern coast of Costa Rica.

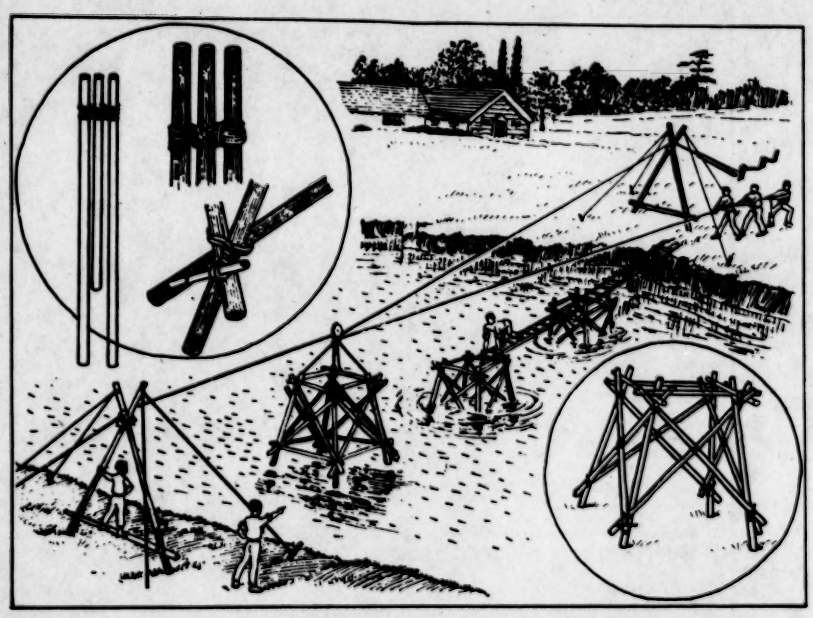
You can help the project and receive the newsletter Annals of Earth *by contributing $10 or more to Ocean Arks International, 10 Shanks Pond Road, Falmouth, MA 02540.*

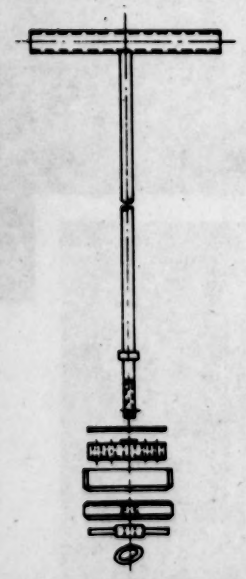
—J. Baldwin ■

Appropriate Technology Sourcebook

*You may have noticed that the **Essential Whole Earth Catalog** has hardly any Appropriate Tech entries, a category for which we were once famous. The reason is that virtually all the best AT books — 1,000 of 'em — are included in one entry: the **Appropriate Technology Microfiche Library** (see also **WER** #53). Most of the books in that remarkably useful collection, plus a few, are given useful reviews in the **Appropriate Technology Sourcebook**, making it a highly refined index to the **Microfiche Library** and greatly enhancing its usefulness. I can't praise this effort too highly. It's one of the best ideas I've seen in my 20 years of AT work. Well executed, too. If you work in less-developed countries, you need this!*
—J. Baldwin

Appropriate Technology Sourcebook
Ken Darrow
and Mike Saxenian
1986; 800 pp.
$17.95 postpaid from:
Appropriate Technology Project/Volunteers in Asia
P. O. Box 4543
Stanford, CA 94305
or Whole Earth Access





●

A Series of Articles on the Use of Bamboo in Building Construction, MF 25-658, collected by Dr. Jules J. A. Janssen, 1982, 177 pages, L4.50 from ITDG.

This welcome collection assembles a variety of practical bamboo articles in one place. Preservation techniques are followed by sections on the use of bamboo in housing, bridges, water supply, and concrete reinforcement. One article explains how to calculate the strength of bamboo for construction purposes.

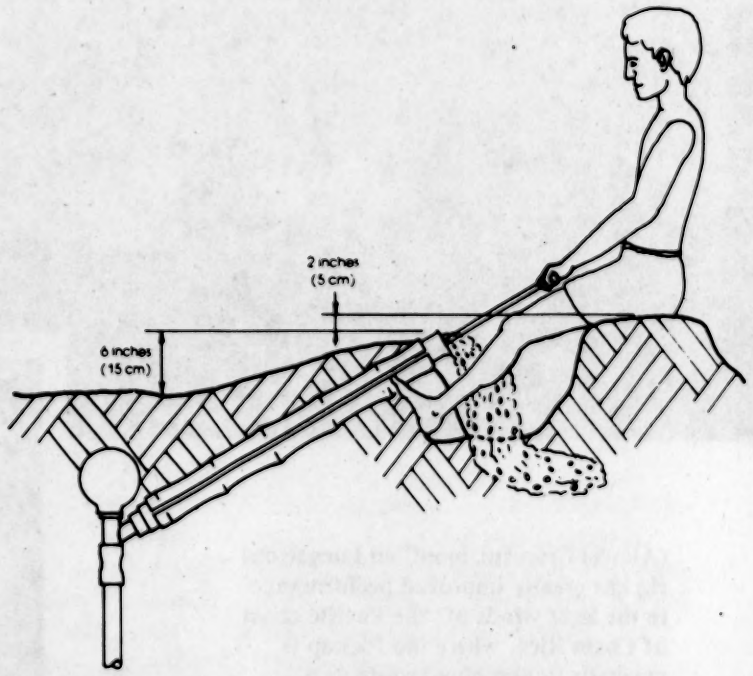
●

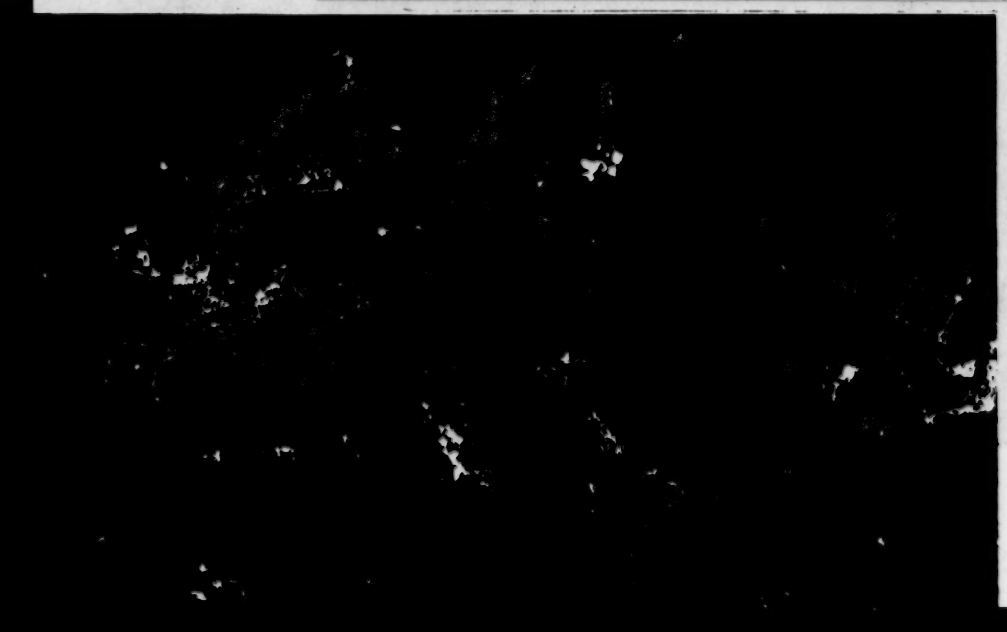
The Rower Pump, MF 14-368, reports and brochures, 1984 and later, available from Mirpur Agricultural Workshop and Training School (MAWTS), Mirpur Section 12, Pallabi, Dacca-16, Bangladesh; or Mennonite Central Committee, 1/1, Block "A" Mohammadpur, Dacca, Bangladesh.

Thousands of low-cost direct action handpumps made of pvc pipe are being used in Bangladesh for low-lift irrigation of small plots. The Rower pump can be easily made in developing countries, and the farmer can do his/her own simple repairs. The pump pays for itself in one crop.

The extremely low cost of the handpump (approximately US$15) and pvc tubewell installation (approximately US$30-45) and the large economic return from small plot irrigation together make this technology an excellent investment for farmers in areas where the water table is shallow (15 feet or less). The Rower pump is probably one of the most important agricultural tools invented in the last 20 years.

Readers seeking information on the Rower pump can write to the manufacturer (MAWTS) for a brochure with technical details. Some of the same material is reproduced in *Handpumps Testing and Development: Progress Report on Field and Laboratory Testing* (see reviews). The results of an extensive laboratory test are described in *Laboratory Testing of Handpumps for Developing Countries: Final Technical Report* (see review). The relevant pages from both of these books are reproduced in the A.T. Microfiche Library as MF 14-368.





Earth at Night

*How we look at night, as seen from a satellite, graced both covers of **CoEvolution Quarterly** #43. Now you can have the image as a nifty 22½ x 34½" poster. Major light sources such as gas flares and forest fires are identified by an extensive key along the bottom of the poster. Must be someone home; there's a light downstairs.*
—J. Baldwin

Earth at Night
$7.50 postpaid from:
Hansen Planetarium
1098 South 200 West
Salt Lake City, UT 84101

Europe and Asia, about one-quarter poster size.

From Debt To Development

Mexico and Brazil each have external debts over $100 billion, most of it owed to increasingly unhealthy U.S. banks. Five other Third World countries have debt burdens over $25 billion each and are equally unlikely to do more than nibble off a bit of the interest on their loans. As for the principal — forget it. For a joker, there's Peru, whose maverick president refuses to pay out more than 10 percent of his nation's income to foreign debtors, saying the nation's first responsibility is to its people, not international banks. For this impertinence, the IMF has cut Peru off from further loans.

A quizzical observer wonders if world finances have always been this way, and if not, how'd they get so shaky? The conventional explanation of the debt crisis is that Western banks indiscriminately lent out income from OPEC price hikes. Then U.S. interest rates soared and Third World borrowers got caught in the squeeze. In other words, it was all just an unfortunate event. Meanwhile, debt keeps ballooning, but no official voice warns that a continually expanding balloon must someday explode.

For those who'd like a less conventional perspective with a much deeper analysis, here's a small, readable booklet published by the Institute for Policy Studies. From the creation of the IMF and the World Bank after World War II to the role of multinational banks and corporations, this is the clearest explanation I've come across as to why so many came to owe so much to so few, after getting so little.
—Dick Fugett

•

International debt is often presented as a problem for large banks and governments that is being resolved among them. The impact of their "resolutions" on workers, peasants, farmers, the environment, and the entire process of development is presented separately, in bits and pieces, and seldom from the viewpoint of the victims. Too often, the debt crisis is viewed only as affecting profligate Third World countries and their peoples. Too seldom are the real costs borne by workers and other citizens in the United States and Europe added to the equation.

•

By focusing on reducing tariffs, GATT [the General Agreement of Tariffs and Trade] echoed the notion, long a favorite argument of powerful nations, that free trade benefits all countries. These same powerful nations were loath to point out that it was behind high protective tariffs that German and American industries grew to challenge the nineteenth century manufacturing power of Great Britain. Economic historian E. H. Carr, with words as true today as when he wrote them in 1940, pointed out: "*Laissez-faire*, in international relations as in those between capital and labour, is the paradise of the economically strong. State control, whether in the form of protective legislation or protective tariffs, is the weapon of self-defense invoked by the economically weak."

From Debt to Development
The Debt Crisis Network
1985; 69 pp.
$3.95
($6.64 postpaid) from:
Institute for Policy Studies
1901 Que Street NW
Washington, DC 20009
or Whole Earth Access

Managing Development in Small Towns

Is there any defense against the uncontrolled growth that seems inevitably to ruin small town charm? Indeed there is. This handbook presents a practiced array of tactics and strategies that have worked, complete with expected legal challenges and other maneuvers by developers. The precedents set by other communities should help yours, especially if you and your planners are aware of them. No excuse now. No jargon, either; the book is easy to read, and its suggestions are backed with copious notes and a rousing bibliography. Take heart! —J. Baldwin

•

Recently, subdivision standards have broadened in scope, and a community may refuse approval of a subdivision plan when the subdivision will cause undesirable off-site problems (hazards or environmental degradation) or increase the burden on such already overloaded public facilities as roads and sewers. In this newer form, subdivision regulations can facilitate orderly municipal growth in accordance with a comprehensive plan by controlling the sequence and time of development.

•

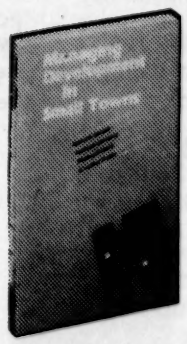
Total population charter provisions attempt to establish absolute limits on permissible population by setting a numerical limit either on population itself or on the number of housing units or related permits.

Viability. Political viability appears to be low. Absolute limitations are viewed as the most controversial method of growth management. Population ceilings treat the growth management process as one of no growth rather than of managed or controlled growth. Most localities have a legitimate need for economic growth, and attempts to prohibit such growth will meet powerful opposition from practically all sectors of the population.

Absolute growth limitations may seem very simple, involving no technical or administrative problems (unless efforts are made to be selective about the growth that takes place prior to reaching the limit), but to be legally acceptable absolute growth limitations must show persuasive reasons for regulating population growth. Gathering evidence to show these reasons — such as clear and overwhelming constraints on the environmental quality of the area — requires very thorough and sophisticated planning capacities.

A jurisdiction that has not undertaken studies to justify the population limitation, that does not have substantial experience with various other growth management techniques, and that lacks adequate expertise in the field of growth management and funding to defend the population limitation provision should certainly not attempt to enact such a provision.

Managing Development in Small Towns
David J. Brower,
Candace Carraway,
Thomas Pollard,
and C. Luther Propst
1984; 176 pp.
$19.95
($22.95 postpaid) from:
American Planning Association
1313 E. 60th Street
Chicago, IL 60637

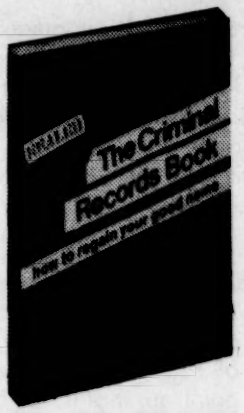


The Criminal Records Book

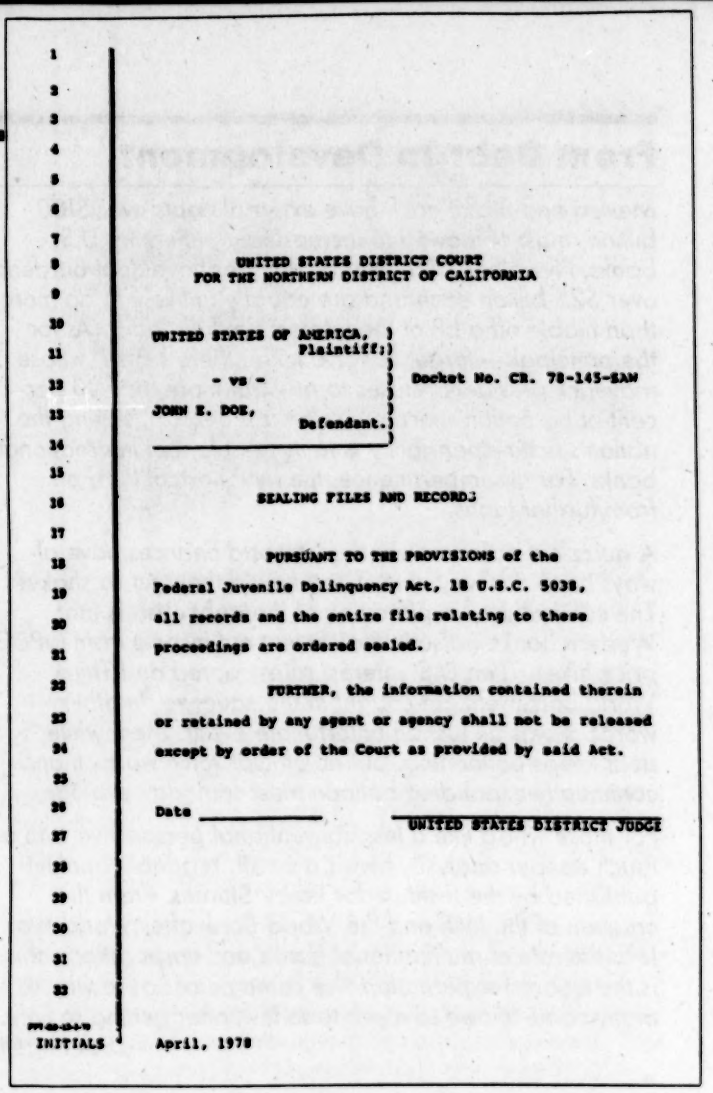
Your bad self has gotten you into trouble. You've gone straight. Can your name be cleared? Maybe. If it's possible to do so in California, this book will tell you how in minute detail. Even shows the forms you must fill out and what to say on them. Though specifically for California folks, the basic steps will work in other states after a bit of imaginative snooping and adapting. If you're contemplating a life of crime, this peek at the bureaucratic hassles involved might serve as a deterrent!

—J. Baldwin

The Criminal Records Book
(How to Regain Your Good Name)
Warren Siegel
1983; 150 pp.
$14.95
($16.45 postpaid) from:
Nolo Press
950 Parker Street
Berkeley, CA 94710
or Whole Earth Access



Federal Juvenile Delinquency Act (18 USC 5038)
If you were under the age of 18 at the time you were accused of committing a federal "delinquent act" ("crime" if you were an adult), your case was processed under the Federal Juvenile Delinquency Act (18 USC 5031). This is a procedure very favorable to you. All records about your case were treated confidentially while the case was in progress, and at the end of the case, your records were automatically sealed. You do not have to do a thing to get your records sealed (18 USC 5038). The law requires it to be done by the court, whether or not there has been a "finding" that you violated the law.



UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA, Plaintiff;
- vs -
JOHN E. DOE, Defendant.
Docket No. CR. 78-145-SAW

SEALING FILES AND RECORDS

PURSUANT TO THE PROVISIONS of the Federal Juvenile Delinquency Act, 18 U.S.C. 5038, all records and the entire file relating to these proceedings are ordered sealed.

FURTHER, the information contained therein or retained by any agent or agency shall not be released except by order of the Court as provided by said Act.

Date _____ UNITED STATES DISTRICT JUDGE

INITIALS

April, 1978

Once your records are sealed by the court, if anyone asks you if you have a record, you can answer "no." It's as if you were *never* involved in a federal juvenile court case.

[Above] is what a federal court order sealing juvenile records looks like.

Legacy of Love

Planning on dying some day? If so, I guarantee that your survivors will be most grateful if you'll read this book before you go.

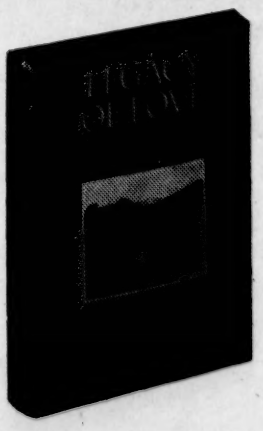
The author was a corporate personnel manager whose duties included making initial contact with survivors after an employee's death. Over the years two facts became evident. First, very few people left their affairs organized, and second, many survivors weren't prepared to deal with the challenges that came from the death of someone close.

What developed was a fill-in-the-blank workbook to be completed in good times. It covers everything from wills, probates, and burial instructions to finances and the right-to-die issue — are you going to want the plug pulled or not? There are also pages for the most profound and most likely to be overlooked items — messages left for our survivors, those few words that we were always going to say, but never did.

Heavy-duty topics, and easy to postpone. Having been through a couple of these close-out-someone-else's-life operations, I can endorse the idea of preparing before, as opposed to coping afterward. If you can admit that there'll be others staying on the physical plane after you leave and that they'll have to clean up your loose ends, then consider this book.

—Dick Fugett

Legacy of Love
Elmo A. Petterle
1986; 208 pp.
$12.95
($14.45 postpaid) from:
Shelter Publications
P. O. Box 279
Bolinas, CA 94924
or Whole Earth Access



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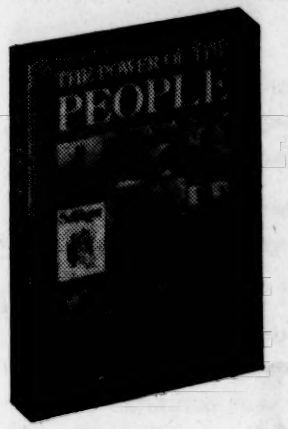


The Power of the People
(Active Nonviolence in the United States)
Robert Cooney and Helen Michalowski
1987; 272 pp.

$16.95
($18.45 postpaid) from:
New Society Publishers
4722 Baltimore Avenue
Philadelphia, PA 19143
or Whole Earth Access

White Southerners pour sugar, ketchup, and mustard over the heads of civil rights demonstrators during a lunch counter sit-in in Jackson, Mississippi, June 12, 1963.

The Power of the People

A pictorial history of the various nonviolent movements in the United States, concentrating on the 20th century.

These are portraits of women and men, many of whom have had a profound effect on our society but have been largely forgotten by history books that feature generals and presidents. Many took great risks, got arrested, and went to prison, over and over because they would settle for nothing less than peace and social justice. They look out at us from these pages to inspire and challenge new generations willing not only to listen to their conscience, but to act upon it at any cost. Active nonviolence is a great and brave tradition that goes way beyond "protest" and links women's rights, peace, racial equality, environment, and basic rights of workers. When you participate in a nonviolent demonstration you advance this tradition.

Sometimes I wonder if it weren't for such people whether we'd be here at all. —*John Coate*

Prison Survival

This is a small, home-published book written by an ex-con named Lou Gattis. Gattis doesn't say where he did time, but the book has clearly been written by someone who has "been there" and is trying to help others avoid some of the problems — social, family, financial and sexual, among others — commonly experienced by new prisoners.

***Prison Survival**'s strong points are its attention to detail — especially in describing routine orientation procedures and social rituals that can get a new inmate off to a good or bad start — and its near-thirty pages of appendices listing many helpful resources for prisoners, including books, correspondence courses, calendars, pages for personal notes and for names and addresses. These appendices alone would be a good reason for prisoners to have a copy of this book.*

The book's most serious weakness is that it claims to be nonreligious when in fact it's quite biased toward Christianity (almost as if no other religions existed). Considering the preponderance of the Islamic faith in prisons (as well as many others, plus all the "nonbelievers" who also need to survive in prison), this is an unfortunate bias indeed.

All in all, Gattis's book is worth reading for the prisoner for the reasons mentioned above. For the nonprisoner, it's a walkthrough of the prison system from the eyes and mind of one who made it out and who still cares enough to direct some energy back inside. —*Bo Lozoff*

•

Do not borrow money! This is a dangerous thing to do. Street interest rates are anywhere from 10% to 22% for housing loans; so don't be surprised to find loan sharks charging 50% to 100% for a loan due back in one week (not a year later). If you cannot pay it back with cash as agreed, you may have to pay as an example to others by being beaten, robbed, set on fire, stabbed, raped, or killed. You are taking your life in your hands when you borrow money. You are putting that life in their hands if you fail to pay on time. Money is nothing to take lightly in prison. You really can die because of it.

•

They think that by buying coffee and such for others, that their generosity will form a protective shield around them. The truth is that usually someone who hangs around for the hand-outs, is the one who sets this (obviously scared) turkey up for the game.

•

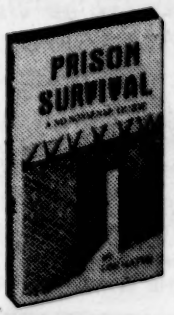
"So shut up. You know your husband's a dirty bird, a declared enemy of SASSIETY! Besides which, the family court judges, the lawyer, the probation office clerks, all these 'perfect people', they have to make a living too, don't they?"

. . . "Dig a little grave in your mind and lay him there. Otherwise they might cook up something on you, too — "

•

Chapels are not cure-all places. They are usually off limits to aggressive and violent homosexuals. They can't stand to be there. While it is true some people use a Bible against homosexual advances, it doesn't always work. However, it does stop the majority of approaches. They feel you're crazy and uncontrollable; and, therefore, if they can't control you, there isn't much satisfaction in taking your "booty" just to show off.

Prison Survival
(A No-Nonsense Guide)
Lou Gattis
1985; 144 pp.
$4.95 postpaid from:
Cheetah Publishing
275 N. Forest Lake Drive
Altamonte Springs, FL 32714
or Whole Earth Access



The Local Employment Trading System

by Michael Linton and Thomas Greco

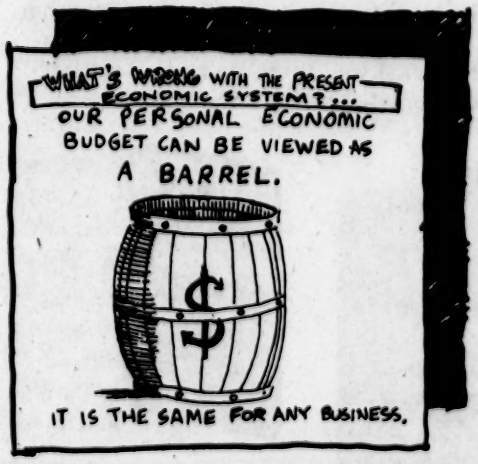
THE PROBLEM OF MONEY

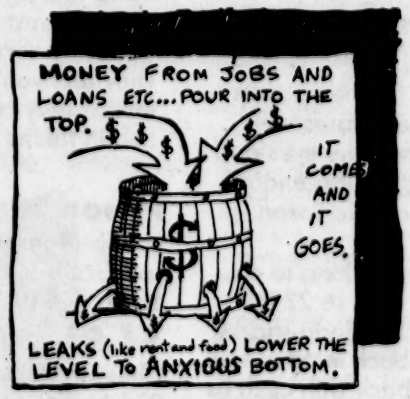
Think of yourself as a leaking bucket. You have only so much water (money) and it is leaking away through holes in the sides and the bottom. The leaks in the bottom are constant. As long as you have anything they will keep running — rent, food, fuel, etc. The side leaks are only relevant when the level is high. They represent spending you do when you can afford to. Your bucket is filled from a variety of more or less reliable sources representing income from employers, customers, lotteries, government subsidies and other trickle-down phenomena. Whenever money leaves your bucket it is essentially gone, and any that returns to your income does so entirely by chance. Since your sources of supply are not entirely reliable, you are generally concerned about the level in your bucket, as is everybody else. Nobody seems to think they have enough. When you deal with another person, money flows from one bucket to another. It's every man for himself out there. Only a fool would think otherwise. A competitive game for survival dominates the economic interactions between people in a community, and between communities in the world.

Given that this is so, the basic strategies and tactics assumed by the players in this game will be selected for their competitive power. This point is so clear to most people already that the major difficulty for them is to see that different games with different behaviors are at all possible.

Once money has been spent, it really makes no difference where it goes, it is gone, with no particular reason ever to come back. This is primarily a structural consequence of the virtually universal transferability of money and the remote locus of control over the money-creation process.

Money comes and money goes, and the way it comes has nothing to do with the way it goes. The real dominant factor is the invisible hand of the market, which demands that money shall flow to the cheapest sources of supply.





Local Employment Trading System (LETSystem) is the name of a remarkable tool for building and strengthening local communities. It's a kind of alternative banking system that is fully compatible with traditional currencies. It is a mechanism for local economic survival when regular money is scarce. And, like any monetary system, it is based on trust.

Michael Linton designed the Comox Valley LETSystem in Courtenay, British Columbia, in 1982 and is busy helping spread the idea to other communities. Thomas Greco is a writer and alternative economist.

Though not essential, the tools that make a LETSystem run smoothly are a telephone with answering machine and a personal computer. Software programs for running a LETSystem and managing the bookkeeping are available. For prices, information or a list of communities that have already begun their own LETSystems, send one dollar of official U.S. or Canadian money to Landsman Community Services, Ltd., 375 Johnston Ave., Courtenay, B.C. V9N 2Y2, Canada.

—Richard Nilsen

illustrations by Don Monet

THE IMPOVERISHMENT OF THE COMMUNITY

The leaking bucket applies not simply to the economic situation of every single person and business organization, but also to every single community, from the village to the nation. You have what you have, and it goes when you spend and comes as you earn. Within the community there exists a cascade of money from bucket to bucket, employing local people until someone spends it outside the community, perhaps on a holiday, perhaps to import tools, equipment, foodstuffs. Each community exists in the world in a more or less precarious balance between its income and expenditure. Hence the drive to export goods to increase income, and the incentive to shop locally, to keep the money in circulation.

From the nation, to the province, to the city and the village, we have an appalling history of selling our soul to the export market.

CIRCUMSTANCES BEYOND OUR CONTROL

There are two characteristics of conventional money that render it ineffective as a proper support for the convivial community. Conventional money, being universally distributable, has no inherent tendency to remain in circulation in any particular community. Conventional money, which is the essential lifeblood of the economy, derives from agencies external to the community. The combination of these factors causes excessive dependency upon circumstances external to the community and essentially beyond its control. Communities dominated in this way tend to become of merely geographic significance, having little or no infrastructure that might reflect self-direction.

Few means appear to exist by which such communities can be induced or coerced into rational management of the flow of conventional money. No boundary conditions exist or can legitimately be created that retain conventional cash without detrimental consequences, such as trade restriction. However, it is entirely possible to create a specifically local currency that ensures a money supply to the community it serves, simply because the money is unuseable, and thus unwanted, beyond that community. ►

LOCAL CURRENCY SYSTEMS: BENEFITS

When a community has its own currency, full employment can be available to anyone who wants to work and has a skill or service, of any nature, that is required by that community. It need no longer be the case that there are jobs that need doing and that people who wish to work are kept idle for want of money. This is a natural consequence of the necessary recirculation of the local money; in contrast, conventional money will generally drain out of the community to the cheapest available source of labor or goods. A community with its own currency has the capacity to adopt and maintain coherent and relevant directions of development with minimal dislocation by external events.

It generally seems to have escaped notice that money today is essentially a mere promise that value will be given. We are willing to trade in such promises when they derive from governments, one of the least reliable of institutions, but it seems that people are unwilling to go very far in trusting each other as individuals. At the root of the matter lie two fundamental causes — (1) the isolation of the individual from any integral local community and (2) the failure to take personal responsibility and to assume risk.

It makes greater sense to base a money system on the promises of the individuals who make up the community itself and are the actual producers of value. The promise suggested is not the promise to repay cash to the community for goods received (we know that such promises are too dependent upon external circumstances beyond anyone's control to be reliable), but a promise to make some time or goods available at some future date, which is only jeopardized if the promiser is persistently unwilling or dead.

If you could give your word and thereby create a money that would circulate in your community providing for the support of many others, all the while remaining available for you to earn back, providing, in that act, service for others as you yourself were first served, why would you not do it?

LETSYSTEMS

A Local Employment Trading System (LETSystem) is a self-regulating economic network that allows its members to issue and manage their own money supply within a bounded system. Essentially, a LETSystem resembles a bank, and being a member of a LETSystem is as simple as having another bank account. Members' accounts hold "green" dollars, a currency equivalent in value to the federal dollar, but no money is ever deposited or withdrawn. All accounts start at zero and members can use "green" dollars only with other members. The system is thus always exactly balanced with some of the members in credit and others in debit. This creates a local recirculatory currency, whose effectiveness is determined by these arrangements:

There is never any obligation to trade.

Any member may know the balance and turnover of another member.

No interest is charged or paid on balances.

Administrative costs are recovered, in the internal currency, from member accounts on a cost-of-service basis.

LETSystems are self-stabilizing, set-up costs are minimal and the operation can be self-supporting from the outset even at a fraction of its full capacity. Administration is simple and requires no special training.

Henry Ford said it was good engineering to "Simplicate and add lightness." LETSystems as described above represent the simplest and lightest method yet devised to account for the give and take that is trading in the world.

A LETSystem is a facility that allows its members to generate and manage their own currency system independent of and parallel to the federal monetary system. It offers communities everywhere the tools to stabilize and support their local economy without diminishing their participation in the whole. It allows members of the local community to exchange goods and services on a "green dollar" basis when federal dollars are scarce or unavailable.

This appears to be the first effective application of network concepts, as distinct from hierarchical structures, to economic theory and practice. What is new about a LETSystem is that it is not a bank, or a credit card barter system, but in fact, an independent local economy.

Money is an information system we use to deploy human effort.

A LETSystem supplements the conventional monetary system to bring underemployed resources, people, equipment, land, and energy into effect as they are needed by the community. Conventional currencies have many inevitable structural problems, such as instability, management of volume, reserve backing, and administrative costs. The management of the money supply is the major problem of current economies.

The expedient of allowing the individual to issue money ensures that the money supply reflects the needs of the community. This is impractical in a paper monetary system, but can be easily administered by a computer network. Most communities, and many nations, are excessively dependent upon imports and exports and have little internal structure and economy. When exports lag behind imports, a currency shortage develops and people lose their livelihood. This is often unnecessary, since it is, generally, only the money that is missing. People, tools, energy, and materials are often all at hand and a local currency can almost invariably return any community to full employment.

Conventional currencies and exchange systems are broad-scale and impersonal, i.e., the conventional currency is accepted by everyone, or nearly everyone, within a wide geographic area. Seller and buyer need know nothing at all about each other. Possession of the currency speaks sufficiently of itself for an exchange to take place (since possession of the currency implies that the possessor has already delivered valuable goods and services to the community). LETS, on the other hand, is limited-scale and personal. Exchange agreements are, or should be, based upon personal history (account activity ratio) and reputation of the buyer, since a debit balance represents a commitment to the community.

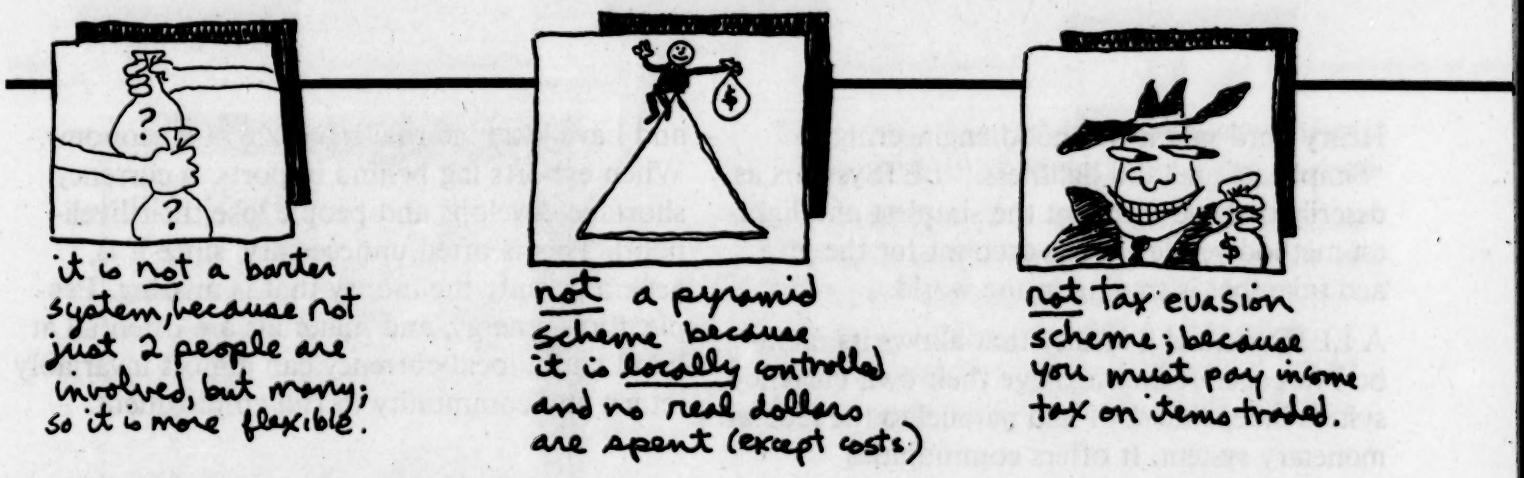
ESSENTIAL CHARACTERISTICS

1. A LETSystem is operated as a nonprofit agency whose rights and authority are vested in a TRUSTEE who acts as an agent for the members who are principals. LETS provides a service that allows members to exchange information to support trading and maintains such accounts of that trading as members request.

2. The agency maintains a system of accounts in a quasi-currency, the unit of value being related to the prevalent legal tender.

3. Member accounts start at zero; no money is deposited or issued.

4. The agency acts only on the authority of a



member in making a credit transfer from that member's account to that of another.

5. There is never any obligation to trade, but members must be willing to *consider* trading in "green" dollars.

6. A member may know the balance and turnover of another member.

7. No interest is charged or paid on balances.

8. Administrative costs are recovered from member accounts on a cost-of-service basis.

9. Accountability for taxes incurred by members is the obligation of those involved in an exchange, and LETS assumes no obligation or liability to report to taxation authorities or to collect taxes on their behalf.

PROCEDURES

The bookkeeping function of the LETSystem closely resembles that of a credit union whose members can use the currency only in trade with other members. Hence credit transfers between accounts and the issuing of periodic statements are the only necessary accounting procedures. This can be done by hand or computer, as appropriate.

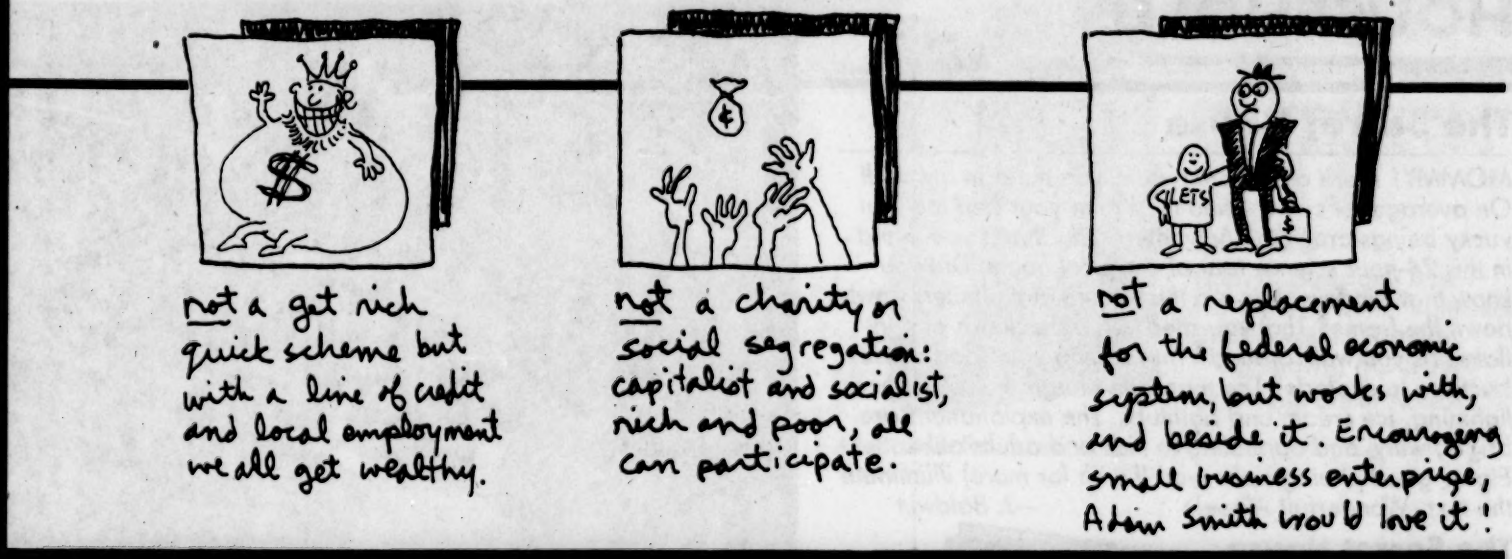
The currency unit used in the system should be recognized as equivalent in value to the regional legal tender so that valuation between members is customary and the LETSystem can associate accurately with the existing economy. It has to be clear to all participants that the internal currency of the system has no intrinsic value. It is never issued and cannot necessarily be cashed. The distribution and development of LETSystems therefore will generally reflect natural geographic regions and economic communities.

Accounts can be positive: when a member has earned more than spent to date; such accounts are "in credit." Equally, some accounts must be negative: the member has received more than he has contributed; in which case the account is considered to be "committed." Clearly, only those accounts in credit risk loss if the currency should devalue. The economy is thus always balanced, the total value of green dollars held in credit being matched by the commitment of the members in debit. The individual member effectively issues money into the community by spending, and redeems it by earning or selling. All transfer from a member's account is on that member's authority and may not be enforced otherwise. Neither can a commitment be invoked. The commitment is to the community as a whole, not to any one person, so no member can ever demand performance from another. However, a member who is reluctant to earn or receive green dollars will find it progressively more difficult to spend them, since this information is freely available to any member from whom he might want to buy.

A negative bank account is a private matter, but a negative LETS account is an issuing of promises in a community, and is thus, de facto, a public act. The LETSystem offers a facility, and proposes an ethic, that services can be exchanged on a "cost-to-provide" basis including reasonable profit. It is appropriate that its own service is offered in this way. The constitution of LETSystems as nonprofit agencies, paying administrative staff at current market rates, will obviate tendencies to profiteering.

EXAMPLES

Joe cuts firewood. Peter is a welder, and he wants wood but has no money. Joe doesn't want any welding. In a barter system, that's usually where it stops. However, if Joe and Peter are members of the LETSystem, then Joe delivers the wood, and Peter picks up the phone. He dials the LETSystem office and says, "Hi, this is Peter, No. 48, please acknowledge Joe, No. 83, $75 for firewood." Joe's account balance in-



creases and Peter's decreases by $75. In turn Joe employs the carpenter, the carpenter gets a haircut, gets some clothes made, buys food from the farmer. The farmer now has a way to pay for a welder, so Peter gets to work again.

And so it goes. The unit of exchange, the green dollar, remains where it is generated, providing a continually available source of liquidity. *The ultimate resource of the community, the productive time of its members, need never be limited by lack of money.*

Margaret needs the brakes fixed on her car. She is billed for parts and taxes in federal dollars, which represent the essential outgoing costs involved, and pays the balance in green dollars.

The same procedure takes place when businesses trade within the LETSystem. For the retail merchant, a LETS exchange works like this: A customer buys a $30 pair of shoes; price to a LETS member could be $20 cash, $10 in green dollars, credited to the merchant's account. This credit can then be used by the retailer in dealings with other LETS members, businesses, or individuals. Each retailer has total control over the store's pricing system to include collection of taxes, overhead, and markup.

Any business can use green dollars to improve its trading position without causing cash flow problems or any disruption of its normal business. Suppose a business is barely meeting overhead, has no cash to spare and sees no way to use green dollars for business expenses or stock replacement. Any trade using green dollars should then be arranged so that all marginal cash costs of that trade are met in cash, and further, that cash is also paid to meet tax commitments, both sales tax and income tax liabilities deriving from profits. This strategy avoids all risk and covers all cash costs.

In many cities in North America there are commercial agencies, called barter exchanges, offering services to businesses similar to those offered by a LETSystem. These are, however, all organized on different principles, and charge users initiation fees of at least $300 with a commission of about 8 percent, in cash, on all transactions. Despite such high costs and many limiting regulations, businesses find it profitable to use these services. LETSystems offer the same services at less than a tenth of the charges of the average commercial system, and access a far greater customer base.

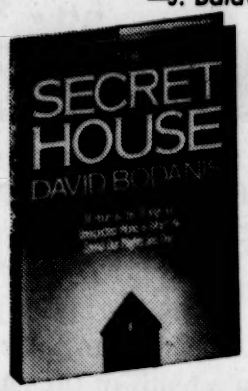
As more goods and services become available for green dollars, businesses will be better able to absorb costs in green, thus expanding their capacity to sell in green. This will eventually raise the applicability of green dollars to that of a full local currency. The effect of a local currency will be to protect local producers from being undercut by imported goods, and thus provide a more stable environment for developing the local infrastructure. This will be of particular benefit to local food producers with ecologically sound farming practices that make price competition with agri-business difficult. Charity groups and service clubs which have found fundraising difficult during a recession will also be able to raise donations more easily in green dollars. Donors will be comfortable in contributing funds which are more likely to return to them as income, particularly since their other expenditures are not thereby limited.

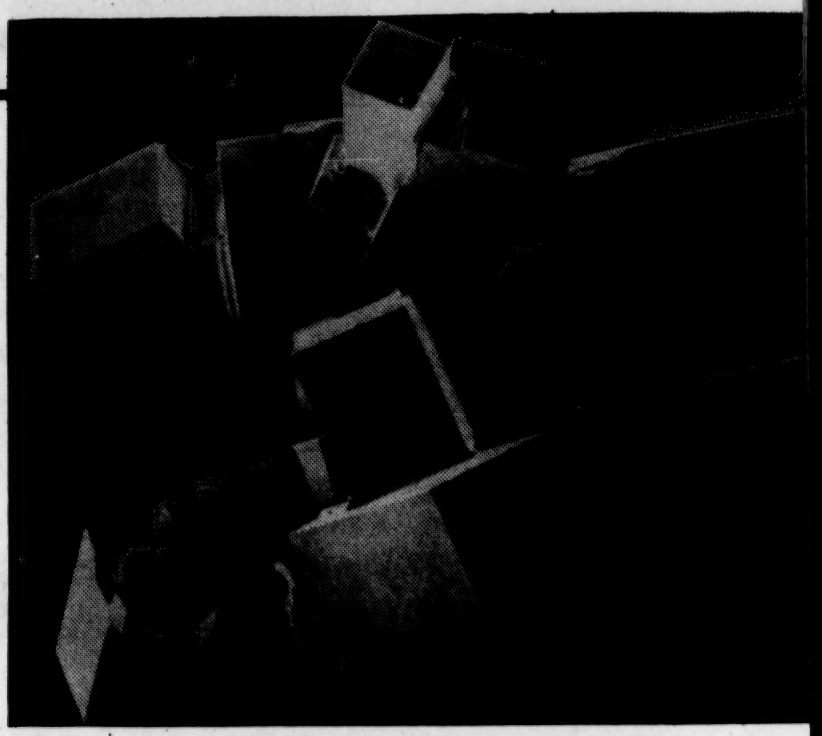
An organism is defined by its skin, a boundary layer that selectively allows the free transfer of some materials while retaining others. The more complex the organism, the more its activity is related to internal processes than to transfers across the skin. The only skin possessed by a community in present circumstances is geographic and is related to transportation costs. Since the last half-century has seen transport costs steadily decline, most of our communities have been reduced, by excessive dependence on imports and exports, to extremely primitive economic processes. LETSystems are a way to give local communities new skins. ■

The Secret House

MOMMY! There are about two million mites in my bed! On average, of course, and they're in your bed too. But yucky beings aren't the only interesting things you'll find in this 24-hour science tour of a typical home. Did you know that window glass is a thick liquid that glaciers slowly down the frame? That you shed veritable clouds of skin flakes as you walk around? That salting your food causes bacteria to explode? The tour talks of light bulbs, sneezes, lightning, ice cream and bathtubs. The explanations are bright, witty, and appealing to kids and adults alike. Eighty good photographs (you'll wish for more) illuminate the text. Wonderful! Aieee! —J. Baldwin

The Secret House
David Bodanis
1986; 223 pp.
$19.45
($20.70 postpaid) from:
Simon & Schuster
200 Old Tappan Road
Old Tappan, NJ 07675
or Whole Earth Access





Salt. Pure sodium and chlorine ions will build up a perfect cube, but in table salt (seen here) impurities produce this extraordinary fleet of interlinked, only partially developed blocks. They are rigid enough to survive in this shape without breaking when shaken onto our food.

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As the roar continues and the vacuum cleaner is moved back and forth directly overhead, the winds on the bottom get worse and worse. Not only are the dust pebbles being pulled up, not only are the broken matting fragments and other debris being hauled up out of sight into the sky, but even the living mite populations are beginning to be dragged away. At first it's only the stacked piles of mummified great-grandparent ancestors who go, swaying and rocking till they soar straight up in the suction wind, their hollow husks too light to resist. But then the smallest baby mites get tugged up, their eight legs grasping down as hard as they can to resist, but the vacuum pull is great, and their weight is slight, the feet pull loose, one by one, and then the young creatures are accelerated up and out of sight in the gale too.

It sounds horrendous, but we're not mites. The baby mites whooshed into the vacuum cleaner survive their high speed ascent without harm. Their tumbling and twisting in the air is safe enough, and when they do land in the cleaner's bag their touchdown will be cushioned by the piles and piles of dust already there. Nor is this just ordinary, run-of-the-mill, sneeze-producing and forget-about-it dust. Sucked up in the house this dust has a terrific number of human skin flakes in it, and skin flakes, remember, are the favorite food of these mites. They have landed in dust mite heaven.

The human pushing the vacuum cleaner gets peppered with millions of high speed dust and mite pellets every minute. It's not a gentle pitter-patter either, but a wall of blasting shots, as if a fleet of miniature wooden sailing ships were blasting shells of hardened mite faeces and dust particles from their brass cannons in one broadside after another through giant nets (the bag) against him.

Dust mite grazing amidst contents of vacuum cleaner bag.

Radon Testing Service • Radon Reduction Methods

The tasteless, odorless radioactive gas radon is a leading cause of lung cancer in America. Generated by the breakdown of uranium, radon can concentrate in dangerous levels in trapped indoor air. It can also enter a house via groundwater and be breathed into the lungs in a steamy shower. Concentrations vary widely with soil geology from place to place. A simple test for radon should definitely be added to the list of things to do if you are buying or building a house.

We used the Radon Testing Service to check levels at the Whole Earth office and four of our homes. All levels were safe, leaving us free to continue worrying about the next big earthquake. The service was prompt and informative.

If your living space has a problem with radon levels, there are simple and practical remedies, neatly explained in the recent EPA pamphlet ***Radon Reduction Methods****.*
—*Richard Nilsen*

Radon Testing Service
$25
for 7-day exposure test (includes shipping and analysis of testing device) from:
Radon Testing Service
P. O. Box 19425
Pittsburg, PA 15213

Radon Reduction Methods
(A Homeowner's Guide)
1986; 22 pp.
free from:
Environmental Protection Agency regional offices

Constructing a vault for a skylight.

Ceramic Houses
(How to Build Your Own)
Nader Khalili
1986; 221 pp.
$19.95
($21.45 postpaid) from:
Harper and Row, Publishers
2350 Virginia Avenue
Hagerstown, MD 21740
or Whole Earth Access

Geltaftan Foundation, Inc.: P. O. Box 145, Claremont, CA 91711.

Ceramic Houses

Fire an adobe house as if it were a huge ceramic pot. It would then be weatherproof, earthquake-resistant, and about as permanent as a building can get. You could even glaze it. What a wonderful, simple idea! Think of the possibilities, particularly in places where modern building materials are expensive, inappropriate (which is often), or unavailable. Architect Nader Khalili first wrote of his attempts at actually doing this in a book with the unlikely name ***Racing Alone****. It was inspiring, but for some inexplicable reason it was published without illustrations.* ***Ceramic Houses*** *is equally inspiring and is loaded with drawings, whole chapters on Middle East adobe building technique and aesthetics, structural theory made easy enough to use, and, at last, photographs. The how-to is experienced and presented in enough detail to enable you to actually give it a try.*

A whole new way of looking at architecture is a rare event, but that is what we have here, folks. The technique is called geltaftan, from the Persian "gel" — clay, and "taftan" — firing, baking or weaving. The book carries not only the details, but the spirit. It's just plain super in every way. It gets my highest, most enthusiastic recommendation. —*J. Baldwin*

(You can help this work along and keep up with the latest news by joining the Geltaftan Foundation. —JB)

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It is amazing how blind specialists and government advisors are to seeing that every time a large quake hits, all their "modern" buildings are leveled as well, and all that is left, if there is anything, are domed clay or brick traditional buildings, more of which will last if some improvements are made on their materials and techniques.

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To a ceramic bowl, which includes three elements (earth, air, and fire) water is a welcome addition. Each element enhances the other, none destroys the other.

In a word, what we lack in our earth architecture may be the fourth element, fire. Fire can bring about an equilibrium with the earth, water, and air. And that thought led me to search for an answer.

Steam rises from the old adobe structure for many hours as the fire continues to burn inside. The firing process also makes the vermin-infested house hygienic.

Natural Energy and Vernacular Architecture

Egyptian architect Hassan Fathy created a stir in 1973 with his heretical ***Architecture for the Poor*** *(University of Chicago Press) in which he showed that common people in hot-arid climates had intuitively developed an architecture that was superior to modern fashion. Mr. Fathy's new book takes this theme much farther as he explains the scientific basis for the energy efficiency of the traditional styles, and how they can be used today to great mechanical, energetic and cultural advantage. This is one of the world's few master architects talking: skilled, urgent, frustrated, yet still hopeful. I've rarely seen the complexities of the modern vs. traditional argument so well presented.* —*J. Baldwin*

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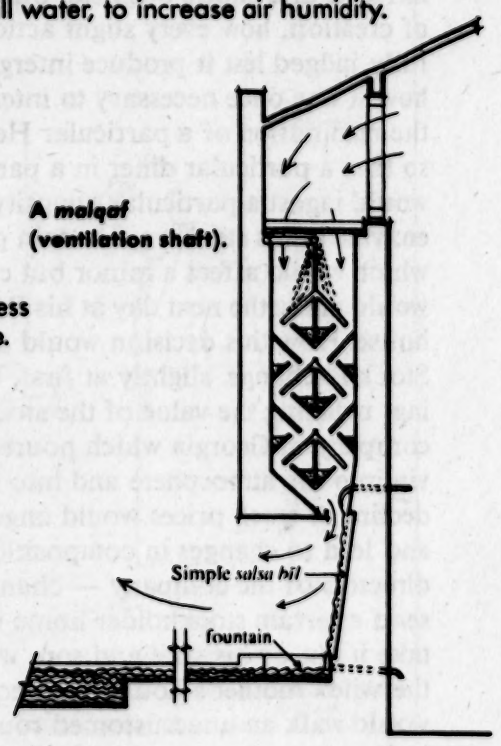
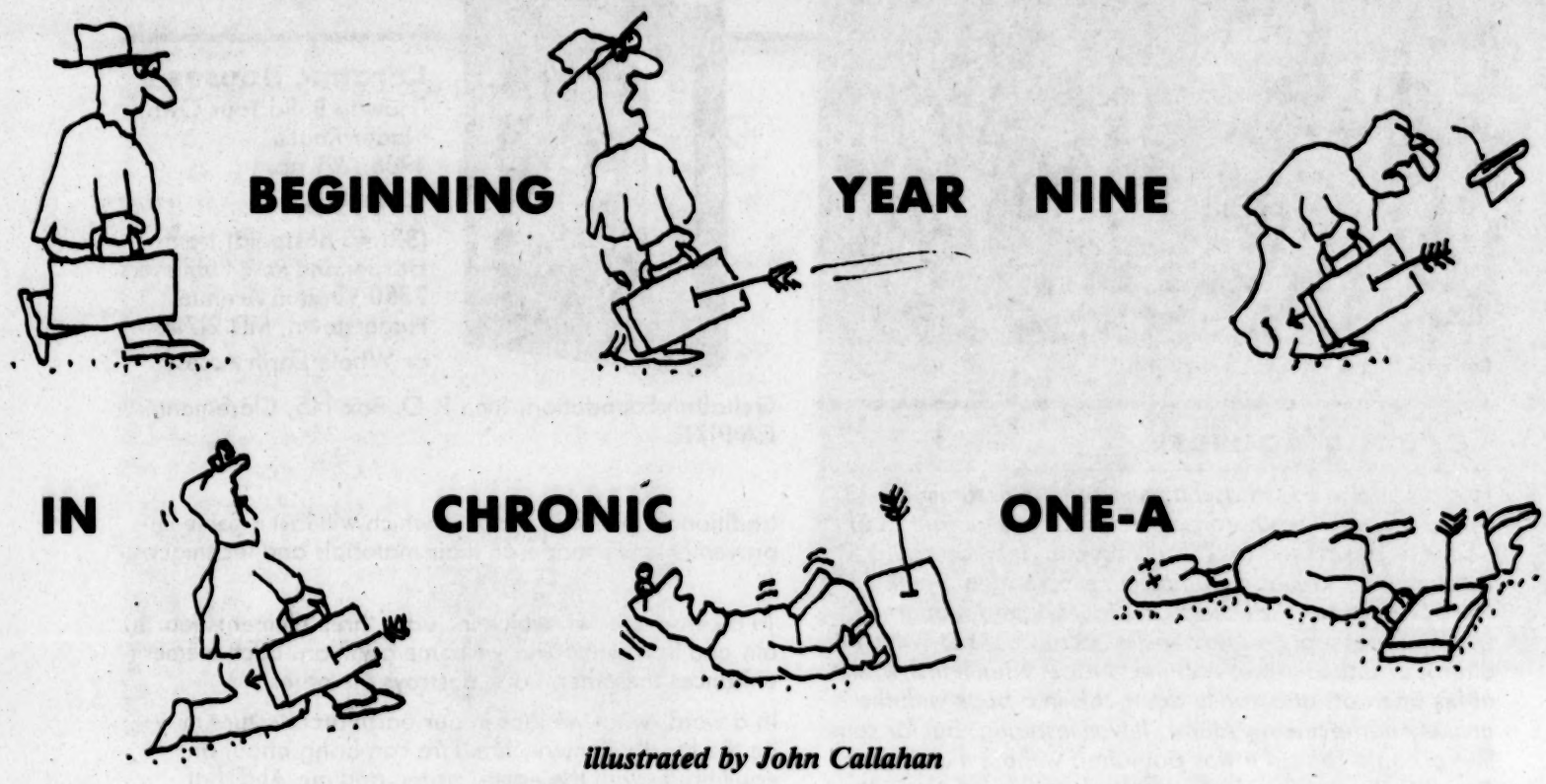
By increasing the size of the *malqaf* and suspending wetted matting in its interior, the airflow rate can be increased while providing effective cooling. People in Iraq hang wet mats outside their windows to cool the wind flowing into the room by evaporation. The matting can be replaced by panels of wet charcoal held between sheets of chicken wire. Evaporation can be further accelerated by employing the Bernoulli effect or Venturi action with baffles of charcoal panels placed inside the *malqaf*, as shown. The wind blowing down through the *malqaf* will decrease the air pressure below the baffle, which increases airflow and thus accelerates evaporation. Metal trays holding wet charcoal can be advantageously used as baffles. Air can be directed over a *salsabil*, a fountain or a basin of still water, to increase air humidity.

Natural Energy and Vernacular Architecture
Hassan Fathy
1986; 172 pp.
$10.95
($12.20 postpaid) from:
University of Chicago Press
11030 South Langley Ave.
Chicago, IL 60628
or Whole Earth Access



A *malqaf* (ventilation shaft).



illustrated by John Callahan

by Dallas Denny

EVERY THIRTY SECONDS, Johnson takes a deep breath. Then he does these things: tugs at his left earlobe; touches his thumbs and forefingers together, making a triangle which he holds high in front of his face; puffs out his cheeks, expelling the air which he has been holding in with a rush and a flourish. Johnson has been doing these things with compulsive regularity all morning, about four hours now since breakfast. It makes me very sad to watch him. When first he came here, before the Thorazine, Johnson understood the causal relationships between his body movements and certain processes of the universe. He was wonderful to watch, running the cosmos, orchestrating the movements of planets around stars in galaxies near the event horizon, as well as taking care of business closer to home — choreographing the traffic lights of Cleveland, Ohio, for instance, or regulating the reproductive cycles of certain species of cyclid fish in the Caribbean — all these things with precise swirls and dips of his wrists.

One night, in the therapeutic semi-darkness of the bedroom, while the attendant dozed in the nursing station, Johnson, thinking I was asleep, explained it all to Parsons, who was choking to death and therefore unlikely to betray the confidence: how it was an intricate and subtle business, oiling the machinery of creation, how every slight action had to be carefully judged lest it produce intergalactic catastrophe, how it was once necessary to interfere slightly with the rumination of a particular Hereford in Colorado so that a particular diner in a particular restaurant would ingest a particular quantity of a particular enzyme in his steak on a certain preordained night, which would affect a minor but crucial decision he would make the next day at his Wall Street brokerage house. How this decision would affect the New York Stock Exchange, slightly at first, but then snowballing, reducing the value of the stock of a troublesome company in Georgia which poured too much effluvia into the atmosphere and into streams. How the decline in stock prices would anger stockholders and lead to changes in composition of the board of directors of the company — changes which would send a certain stockholder home in quiet fury to take it out on his wife and son, who would flee to the wife's mother's house. Consequently, the boy would walk an unaccustomed route to school the next day, and would therefore miss kicking a rock — a rock which, Johnson assured Parsons, who was by now quite blue, contained the spirit of Booker T. Washington and would be better left undisturbed, lest it turn in wrath and wreak peanut havoc upon the land.

Critical work, this, and now Johnson, thanks to the bitter brown pill, in no shape to perform it — Johnson, since the little doctor strode through the ward one day and with several almost illegible strokes in Johnson's chart, robbed him of his marvelous complexity of behaviors, reduced to only three: safety off, aim, fire.

It's not much of a system. The safety, which is of course disguised as an earlobe, must be clicked off before every shot. The fingers are used to sight in the target. And when Johnson exhales, puffing out his cheeks, he fires, always at a moving target. Johnson is a sportsman. He doesn't shoot at sitting ducks. But he also doesn't exhale until he fires. As time goes by and his face grows more red, he will settle for less and less of a movement, even a twitch. But sometimes, when nobody is moving, Johnson will jump from his chair, dash across the dayroom, and *make* somebody move, more often than not

sending them sprawling on the floor. Then he exhales with a *whoosh* and returns to his seat.

Everybody is onto Johnson's game, except of course the aides — they're called technicians now, but that doesn't make them any smarter or more perceptive. Sometimes when Johnson aims, everybody in the room will freeze, hanging in space like so many icicles, causing Johnson untold consternation, driving him in desperation to fire on the technicians. Johnson *hates* to shoot the technicians.

Johnson will keep up his shooting until six o'clock this evening. Then his relief, a quasi-mammalian tentacled sea-dweller from Aldebaran IV, will take over. Johnson sometimes wolfs his breakfast because the Aldebaranan dislikes being relieved late. Once it sulked, refusing to take over in the evening, which resulted in poor Johnson having to carry on for thirty-six straight hours. It was quite a night, with technicians about bearing syringes, yelling at Johnson to go to sleep, and he fighting to stay awake through a Dalmane and Librium fog. The Aldebaranan replaced a much more reasonable plant-like sentient from a planet in the Andromeda galaxy after Johnson's mental processes were vasectomized and he was assigned his present, repetitious duties.

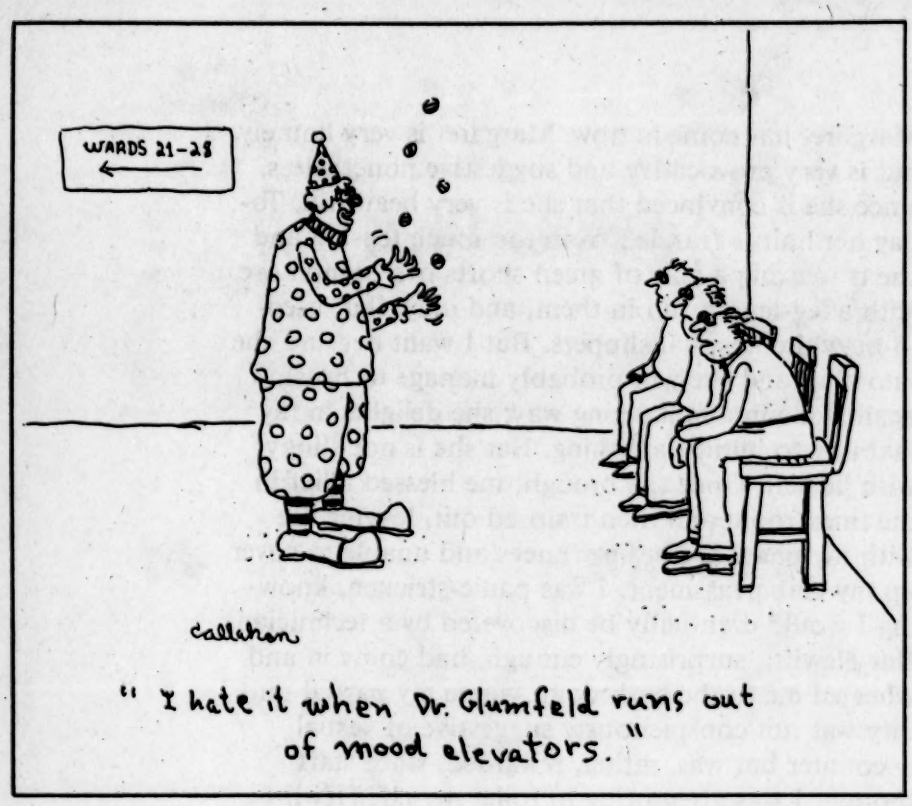
Today Johnson is blasting Morgan, the new guy. He is not aiming directly at Morgan, but everybody knows that Johnson's projectiles are not subject to normal Einsteinian space-time. Every time Johnson shoots, Morgan leaps up and finds another chair. Morgan has been from chair to chair all morning, and this has not escaped the notice of the head technician, although she has no idea why he has been so restless. Morgan doesn't know it, but he is working towards receiving an intramuscular present — one formulated to immobilize him as effectively as ropes by stripping him of all desire for movement, even if Johnson had a real gun and not a breath gun.

I am a Johnson-watcher by orientation rather than by inclination. My wheelchair is turned facing him, and the only one else in my line of sight (besides, about half the time, Morgan) is Hewlitt. Hewlitt sits in one spot all day, unless told to move. It's as if he had a perpetual overdose of what Morgan is about to get. Nobody on the ward knows just where Hewlitt has gone, forsaking his body, but we all hope that one day soon his spirit will reappear, hover like a hummingbird for a moment, and then descend, reanimating Hewlitt and telling us all about its mysterious journey.

I used to want to ask Johnson how to control things, how to control even my arms and legs, but he would have only laughed. Johnson is convinced that I have gone the same place as Hewlitt, that we have both surpassed the need for our bodies, that if he is dedicated enough he might someday be like us. Besides, he would have said, had I been able to ask, how was he to know I wasn't a spy, sitting immobile in my wheelchair for eight years in order to trick him into revealing his methods? Johnson thinks like that. Now his methods are lost, perhaps irretrievably, unless the Thorazine mines all play out.

Margaret has come in now. Margaret is very homely, but is very provocative and suggestive nonetheless, since she is convinced that she is very beautiful. Today her hair is frazzled from too much teasing and she is wearing a pair of green shorts over pantyhose with a leg-length run in them, and ugly, flat, used-to-be-white hospital slippers. But I want her and she knows it, and she will probably manage to brush against me in a tantalizing way; she delights in my inability to initiate anything. But she is not stingy with herself. Once she brought me blessed relief in the linen room and then traipsed out, leaving me with my pants around my knees and unable to cover up my embarrassment. I was panic-stricken, knowing I would eventually be discovered by a technician. But Hewlitt, surprisingly enough, had come in and wheeled me to the bathroom, where my partial nudity was not conspicuously suggestive of sexual encounter but was, rather, rewarded, since staff thought I was attempting to toilet myself. Hewlitt operates entirely at a spinal-motor level. I later found out that it was Daisy, to whom Margaret often brags of her exploits, who had told Hewlitt to rescue me.

Daisy is the perpetual virgin, a Pollyanna with a kind word or deed for everybody, but who about two or three times a year has a seizure that cuts out her cognitive mechanism and leaves her with the psyche of a remote aboriginal ancestor who has a taste for human flesh and a distrust of closed areas. At these times Daisy's body, driven by the spirit of Amanaga Io Managa, becomes so violent that even Jenkins, the three-hundred-pound technician, is afraid of her. Daisy will be here for a long, long time, I'm afraid, because in their efforts to banish Managa from Daisy's brain the doctors sent currents through her head, Reddy Kilowatt on safari. But the



electricity, not finding she whom it was sent to exterminate, turned instead on the native fauna, marching through Daisy's brain like Sherman marched through Georgia. And neurons, unlike trees, do not send shoots up from their blackened stumps. Daisy cannot remember names or faces from day to day; persistent will be the suitor who can come to know her well enough to enjoy her favors. Daisy is a proper type of girl. But the aborigine, with wits and memory intact, still surfaces from time to time, hating and hurting, using the primitive weapons of tooth and toenail to bite and kick her way towards freedom.

Margaret, on the other hand, has muscles that periodically betray her, locking her in mid-stride into rigid catatonia, forcing her to stand like a bargain store mannequin for an hour or two before she begins to melt to the floor, wilting like a candle in the hot sun.

Johnson began shooting Margaret as soon as she entered the day room, but she is deflecting the bullets with her hand, causing them to arc gracefully right to Morgan, who is still getting hit, still switching chairs, still speeding obliviously toward oblivion. I would signal Margaret to come turn the cassette over, since it has long since reached the end, but it is too close to lunchtime, and it wouldn't be finished before they come to get me for my tray of pureed pap. I listen to two or three tapes a day, when I can get them. They belong to Dr. Sellers, the psychologist, who is blind. Often the tapes are of articles from professional journals, but sometimes there will be a talking book, by Mark Twain, perhaps, and once the Marquis de Sade's *Justine.* Today the tape is entitled "Endocrine status of 17 institutionalized chronic schizophrenic individuals: evidence of irregularity." Yesterday there was an article from a psychotherapy journal about James Joyce. A lot of the stuff on the tapes went over my head at first, but finally I learned what all the buzz words were.

When I first came here, about a year after the Accident, everybody figured the kid had checked out, that there was no driver for the car. It was Dr. Sellers who had insisted that a thorough evaluation of my intellectual functioning be done. She had excused herself on the grounds that, since I couldn't talk much and she couldn't see me move, Dr. Starks should test me. Starks had tested me, angry because he had to test a patient who was not from his unit, and had pinched me viciously on the legs. He should have known I couldn't feel it. And he had lied, reporting that I couldn't comprehend any of the test items and that I was not capable of rational thought. And when Starks was through with me and a technician had wheeled me back to the ward, Dr. Sellers had on hand an electric typewriter with a special mechanism on it that allowed me to poke a pencil into holes to strike the keys, and had waited patiently as I with my spastic but movable right arm had typed a document damning Starks. I'm not sure to this day how she knew that I would be able to type that letter, or how she knew that Starks would abuse me, but my letter, submitted with snapshots of my legs, which had felt nothing but had bruised beautifully, had been sufficient to cause Starks to lose his position and his professional license.

After that everybody was supposed to know that my brain is normal, but a lot of people don't believe it, or else forget. People talk to me a lot of times in baby talk, or worse yet, don't talk to me at all. I overhear a lot of things that I shouldn't because people forget.

I used to get very angry, overcome with loneliness and frustration, and showed it by non-compliance, by soiling and wetting myself, by refusing to feed myself, and by howling and banging my arm on the arm of the wheelchair, but Dr. Sellers came by one day and quietly told me that if I continued I would be moved to Chronic III A. That's the unit where all the real space cadets live.

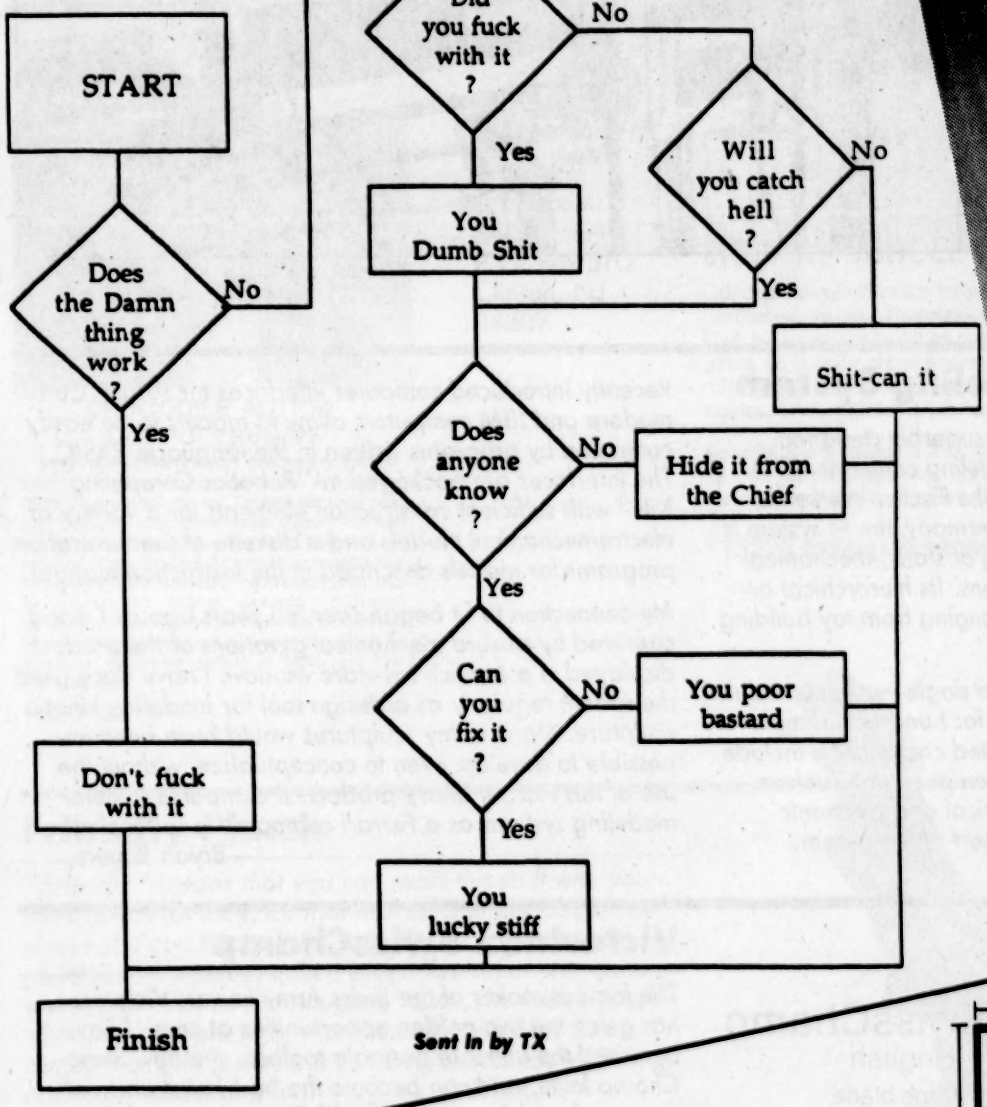
The residents of Chronic III A have had their brains replaced by electrical gadgets. Their limbs move stiffly and mechanically just like the creatures in the old movie *The Night of the Living Dead.* The electric devices are not solid-state electronics, LEDs, microprocessors, circuit boards. No, they are Civil War surplus, Leyden jars, static-electricity generators, Crookes radiometers, obsolete and faulty, making the air of Chronic III A smell of ozone and machine oil and bristle with static electricity. Worn relays click with every bend of every elbow, and even the lights in the eyes of the patients spark and sputter because of loose connections. A transfer to Chronic III A is a one-way warp to electro-mechanico-robotic existence. Bad karma. I do less howling and banging of my arm on my wheelchair now.

I'm getting hit by a few Johnson-bullets now. Johnson won't shoot them until tomorrow, but he'll project them backwards in time until today. They don't really hurt; they're just annoying. Margaret, can you read my thoughts? Don't pretend you can't. Linen room, Margaret. Linen room. LINEN ROOM. L-I-N-E-N R-O-O-M. Yes. Yes, Margaret. Yes. Yes. Yesyesyesyesyesyesyesyesyesyesyesyesyesyes. ■

DOG'S BREAKFAST

(Items off the wall at Whole Earth)

Master TroubleShooting Chart



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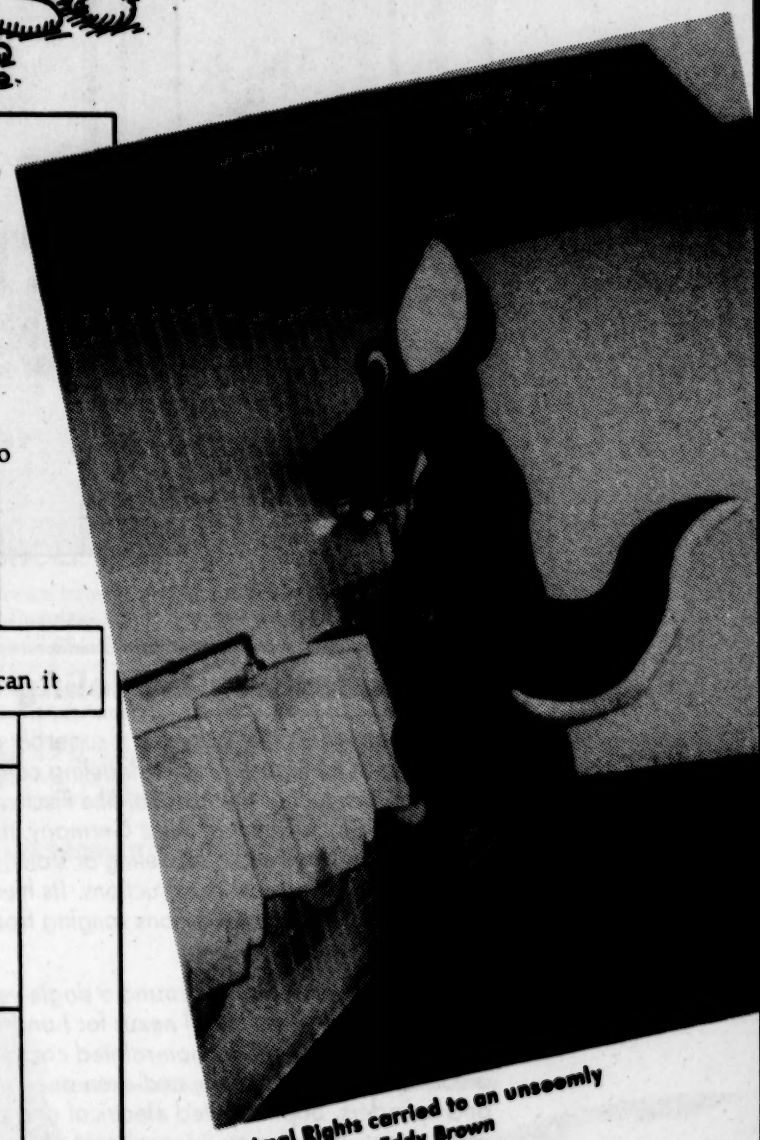
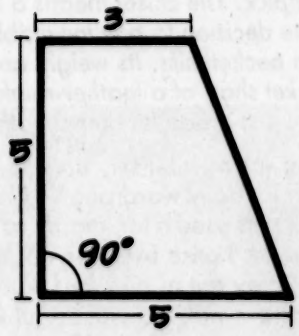


Animal Rights carried to an unseemly extreme —Joe Eddy Brown

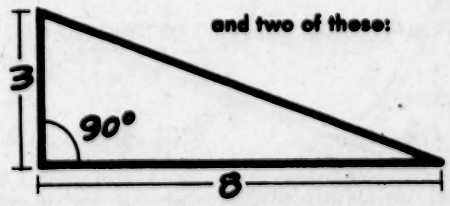
Here's one of my favorite, classic shit-disturbers:

—Resurrected by J. Baldwin

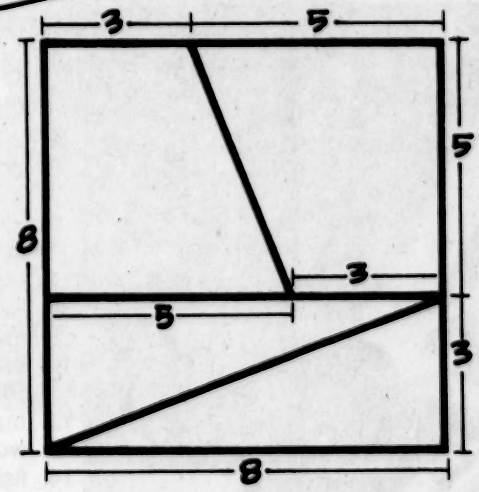
Cut out two of these:



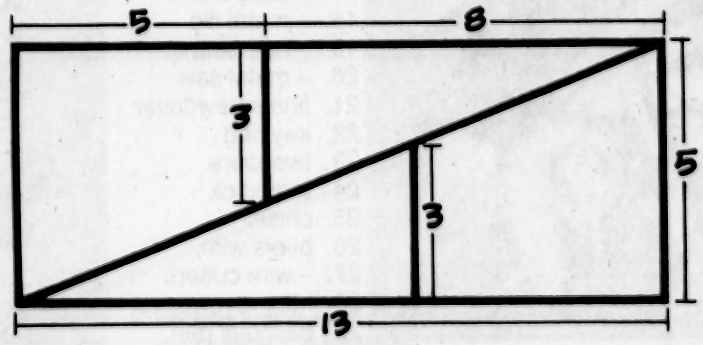
and two of these:



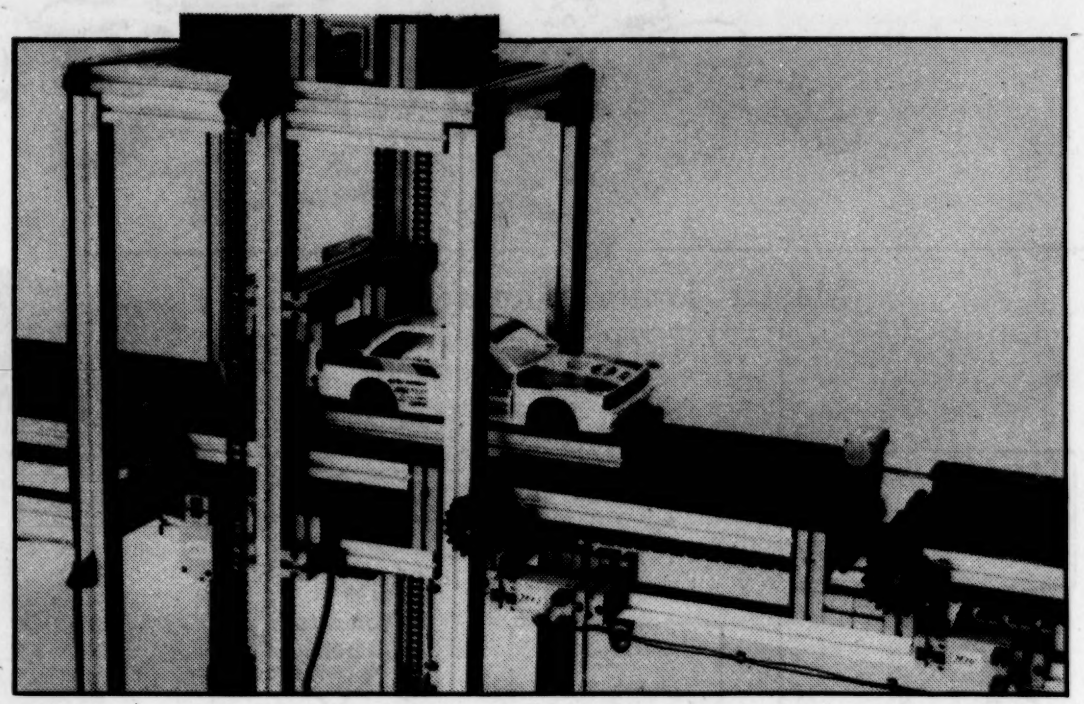
How come, when you assemble the pieces this way, you get a figure 8" x 8" = 64 sq. in.?



. . . But if you assemble the pieces *this* way, you get a figure 5" x 13" = 65 sq. in.? Explain the extra square inch.



fischertechnik Modeling System
$279
Information **free** from:
Jim Bussey
2113 London Circle
Modesto, CA 95356



fischertechnik Modeling System

The fischertechnik (f-t) system is a superbly designed collection of miniature plastic modeling components. A precision product of the hospital-like Fischer-Werke factory in the Black Forest of West Germany, the f-t system is designed for small-scale modeling of static, mechanical and electromechanical constructions. Its hierarchical organization permits applications ranging from toy building to engineering prototyping.

The f-t system is designed around a single versatile module that serves as the structural nexus for hundreds of multipurpose components. Motion-related components include a variety of motors, gears, and even pneumatic valves and cylinders. Sophisticated electrical and electronic components are also an integral part of the system.

Recently introduced computer interfaces for Apple, Commodore and IBM computers allow f-t models to be easily controlled by programs written in the language BASIC. The interfaces are packaged in "Robotics Computing Kits" with sufficient construction elements for a variety of electromechanical models and a diskette of demonstration programs for models described in the instruction manual.

My connection to f-t began over ten years ago as I stood captured by absurd mechanical gyrations of the product displayed in a Munich toy-store window. I have since used the system regularly as a design tool for modeling kinetic sculpture. Many of my sculptures would have been impossible to develop, even to conceptualize, without the use of this extraordinary product. It compares to other modeling systems as a Ferrari compares to roller skates.
—Bryan Rogers

SwissChamp
English

1. large blade
2. small blade
3. corkscrew
4. can opener with
5. – small screwdriver
6. cap lifter with
7. – screwdriver
8. – wire stripper
9. reamer
10. scissors
11. Phillips screwdriver
12. magnifying glass
13. wood saw
14. fish scaler with
15. – hook disgorger
16. – ruler (cm+inches)
17. nailfile with
18. – metal file
19. – nail cleaner
20. – metal saw
21. fine screwdriver
22. key ring
23. tweezers
24. toothpick
25. chisel
26. pliers with
27. – wire cutters
28. Mini-screwdriver
29. ballpoint pen

Victorinox SwissChamp

The famous maker of the Swiss Army knives, Victorinox, has given me two golden opportunities at once. I have acquired the ultimate portable toolbox, the new SwissChamp knife, and can become the best-loved uncle of the year by giving away my old Champion to my 12-year-old nephew.

What does the SwissChamp offer that the Champion doesn't? Well, pliers combined with a wirecutter (finally), a clever miniature screwdriver that stores inside the corkscrew, a small wood chisel, an extra-small screwdriver, and a high-pressure ball-point pen which stores alongside the toothpick. The chisel means a lot to me, but the pliers made the decision to buy inevitable. This is, however, no longer a pocketknife. Its weight and bulk will wear away any pocket short of a leather-reinforced pouch. I wear mine in a self-made leather sheath. *—Michel Bel*

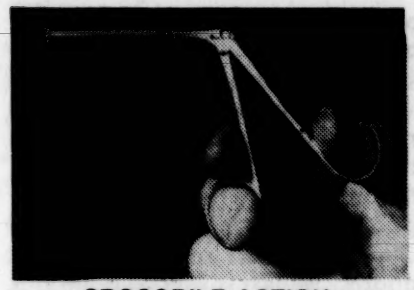
This thing seems a bit silly until you've made it a part of your normal daily wardrobe — like a wristwatch. Once aboard it gets used a lot, mostly as an annoyance-remover. For example, I once used the hacksaw blade on my knife to cut my way out of a locked parking lot after hours. And the corkscrew makes a wonderful knot-untangler. I've had one on me now for about 18 years. No regrets.

By the way, the importer has a spare-parts and repair service. *—J. Baldwin*

Victorinox
Catalog **free** from:
Victorinox/
The Forschner Group, Inc.
151 Long Hill Crossroads
P. O. Box 846
Shelton, CT 06484

Micro-Mark

Caution, this catalog may be dangerous to your checkbook if you're a modelmaker. It's a tempting collection of miniature tools, many of them seldom seen. Did you know that midget versions of power shop tools are available? Or how about tiny dimension lumber, or extra-smooth to-scale paint? There is some overlap with the selection of tools in a typical jeweler's supply catalog, but not much. If you make small things, there's probably at least one item here that you've needed. —J. Baldwin

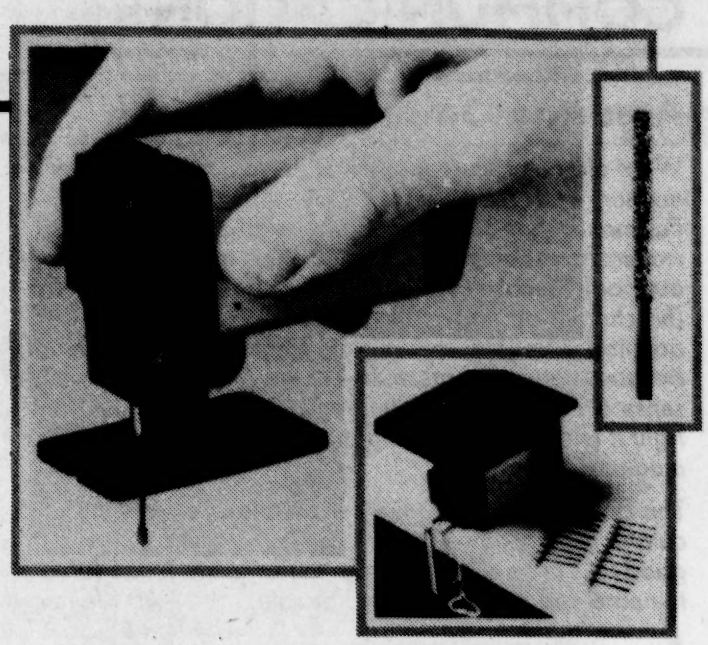


CROCODILE ACTION EAR POLYPUS???

That's right. It's a brilliantly designed surgical instrument for removing foreign objects and performing surgery inside the ear. Unlike a hemostat only the "crocodile" jaws at the very end open. You can actually pass the end through a ⅛" hole and still open and close the jaws! An extremely versatile tool for placement and retrieval of micro-size objects. Use for ship model rigging, dioramas, dollhouse miniatures, model railroad car interiors and hundreds of other types of micro-miniature manipulation. A precision instrument crafted of highly polished stainless steel.

#15265 Ear Polypus **$29.95**

Micro-Mark
Catalog
free from:
Micro-Mark
P. O. Box 5112
Clinton, NJ
08809



JIGSAW / SCROLL SAW

Our Jigsaw cuts intricate fretwork patterns and model parts in softwood, hardwood, plastic, fiberglass and thin plywood and non-ferrous metal. Can be used freehand or converted quickly to a table top scroll saw using stationary table accessory sold below. Can also be used for micro-filing with our diamond coated blade. Includes 10 coarse saw blades for wood and Allen wrench.

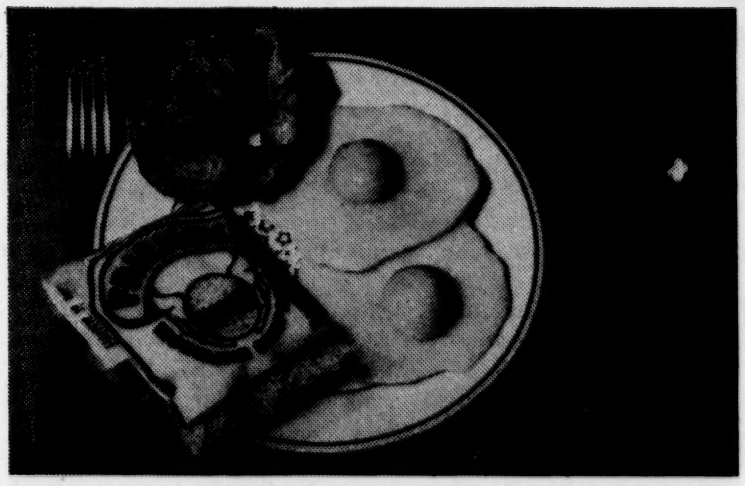
Specifications: weight, 9.2 oz.; length, 3½"; speed, 1,800 to 6,900 rpm; motor, 12 volt, DC 1.0 amp.; max. cutting thickness, 9/32". Use with variable speed transformer #15232 or cables #15233 and 15234.

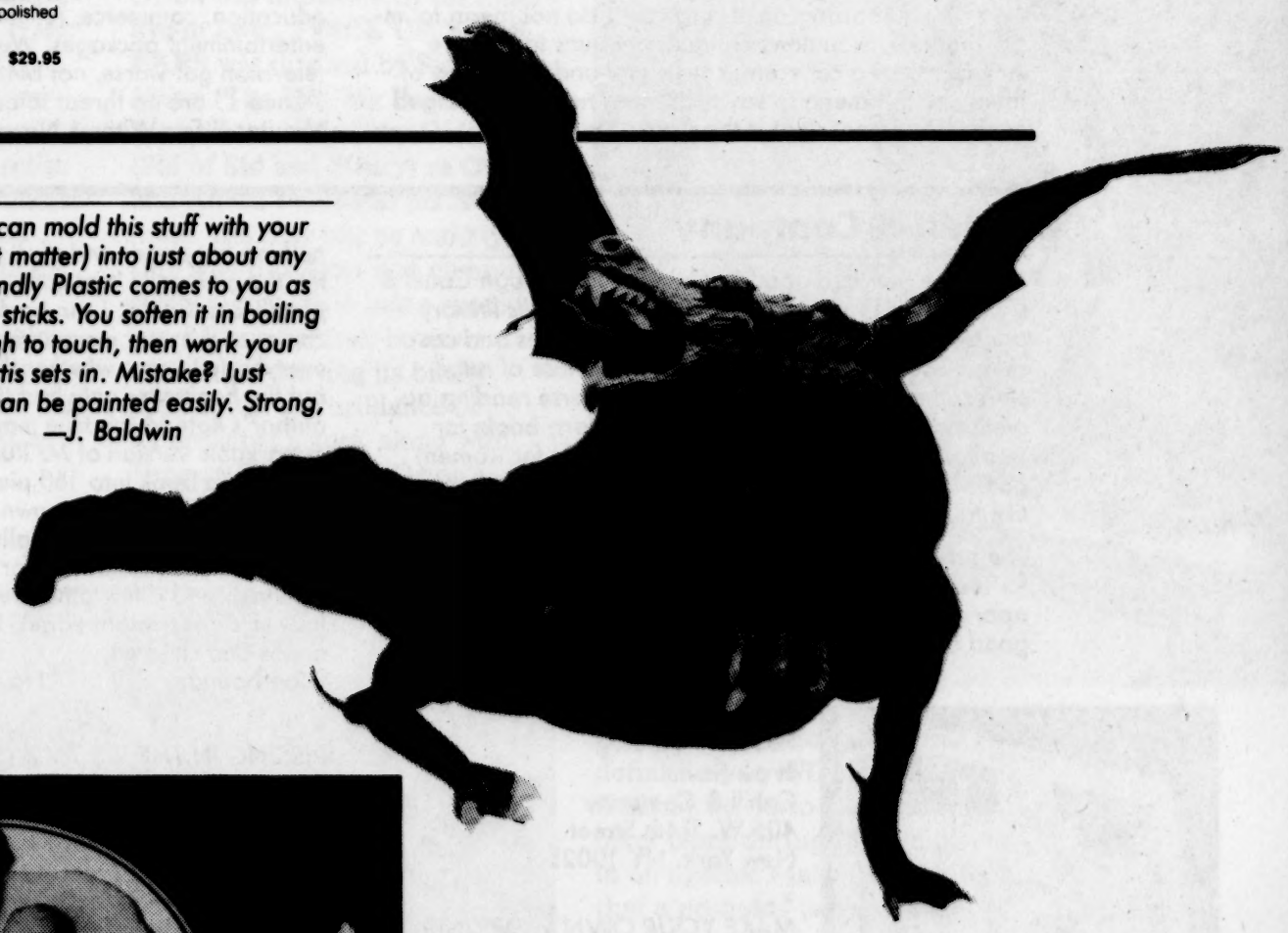
#15226 SPECIAL INTRODUCTORY PRICE $29.95

Friendly Plastic

"Friendly" means that you can mold this stuff with your bare hands (or face, for that matter) into just about any shape you can think of. Friendly Plastic comes to you as pellets or little pieces called sticks. You soften it in boiling water, wait till it cools enough to touch, then work your will upon it before rigor mortis sets in. Mistake? Just remelt it or add a piece. It can be painted easily. Strong, non-toxic, useful and fun. —J. Baldwin

Friendly Plastic
1¾-lb. jar
$25 postpaid;
information **free** from:
The Friendly Plastic
Company, Ltd.
6565 Gunpark Drive
Suite 150
Boulder, CO 80301





Friendly Plastic eggs and croissant are durable and amusing.

Amusing Ourselves to Death

What did our culture lose when its dominating storytelling medium changed from print to television? Author Neil Postman stands out among the several dozen literary wailers and sobbers moaning over this question. He stands out partly because he's bothered to do the right research (his chapter on America in the 1800s as the most print-oriented society in world history is fascinating), but mostly because his judgments make sense. What did we lose? A sense of context and consequence, which would be all right if television were not dominating every other medium in sight.

This book is a starting point for people who want the culture to break free of television's stranglehold, and good luck to you. There's only one antidote to the tube: the care and attention of real people. —*Art Kleiner*

Amusing Ourselves to Death
Neil Postman
1985; 184 pp.
$6.95
($7.95 postpaid) from:
Viking/Penguin Inc.
40 West 23rd Street
New York, NY 10010

•

In watching American television, one is reminded of George Bernard Shaw's remark on his first seeing the glittering neon signs of Broadway and 42nd Street at night. It must be beautiful, he said, if you cannot read.

•

What is happening here is that television is altering the meaning of "being informed" by creating a species of information that might properly be called *disinformation*. I am using this word almost in the precise sense in which it is used by spies in the CIA or KGB. Disinformation does not mean false information. It means misleading information — misplaced, irrelevant, fragmented or superficial information — information that creates the illusion of knowing something but which in fact leads one away from knowing. In saying this, I do not mean to imply that television news deliberately aims to deprive Americans of a coherent, contextual understanding of their world. I mean to say that when news is packaged as entertainment, that is the inevitable result.

•

Television's strongest point is that it brings personalities into our hearts, not abstractions into our heads. That is why CBS' programs about the universe were called "Walter Cronkite's Universe." One would think that the grandeur of the universe needs no assistance from Walter Cronkite. One would think wrong. CBS knows that Walter Cronkite plays better on television than the Milky Way. And Jimmy Swaggart plays better than God. For God exists only in our minds, whereas Swaggart is *there*, to be seen, admired, adored. Which is why he is the star of the show. And why Billy Graham is a celebrity, and why Oral Roberts has his own university, and why Robert Schuller has a crystal cathedral all to himself. If I am not mistaken, the word for this is blasphemy.

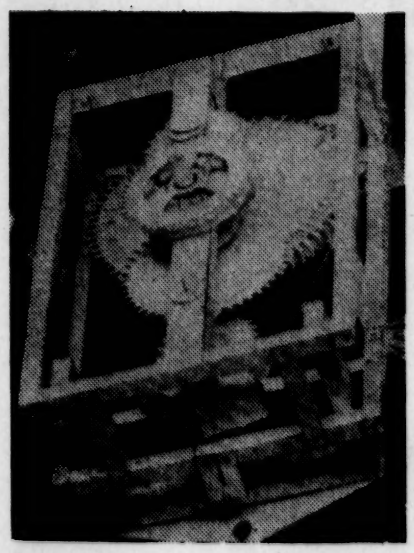
•

Television serves us most usefully when presenting junk-entertainment; it serves us most ill when it co-opts serious modes of discourse — news, politics, science, education, commerce, religion — and turns them into entertainment packages. We would all be better off if television got worse, not better. "The A-Team" and "Cheers" are no threat to our public health. "60 Minutes," Eye-Witness News" and "Sesame Street" are.

Cahill & Company

Over one hundred good books are sold through Cahill & Company, a mail-order catalog that also sells literary prints and Christmas cards, folk song albums and cassettes. Book prices are comparable to those of retail stores; their selection is meant for a diverse reading audience. There are books for Latin scholars; books for small, medium, and large children; books for women; books about the Middle Ages; and books for adults who like to read good stories.

The selection is intriguing, but this catalog is worthwhile for the reviews alone. They're accurate, insightful, and appreciative, indicating precisely the merits of each good book. —*Faith L. Florer*



Cahill & Company
Reader's Catalog
free from:
Cahill & Company
405 W. 114th Street
New York, NY 10025

•

MAKE YOUR OWN WORKING PAPER CLOCK
by James Smith Rudolph
In 1947 when I was a graduate student in Paris, I found a dusty old paperback in a dusty old bookstore. I bought it, took it back to my dusty old room, cut the pages into 160 pieces, folded them carefully, and glued them together to produce a clock that was made of practically nothing but paper and glue. I was astonished to find that the thing actually kept time — even ticked-tocked. Completely captivated, I ran back to the bookstore to buy copies of this very inexpensive book to give to practically everybody I knew, whether they were interested or not, but the bookseller only had three left. So reads the author's note to this true marvel — a new and just as remarkable version of Mr Rudolph's 1947 discovery. By cutting this book into 160 pieces and gluing them together, you'll have your own paper clock that keeps perfect time. Required supplies: glue, scissors (although an X-acto knife is needed for some of the more precise cuttings), and a few other items from around the house (paper clips, straight edge). For adults or children, or adults *and* children.
Paperbound. No. 0666 $8.95

•

PISSING IN THE SNOW & Other Ozark Folktales
by Vance Randolph
This collection's impeccable scholarship is exceeded only by its randy merriment. Randolph, America's premier folklorist, lived and worked in the Ozarks for forty years and more. Because of their — ahem — subject matter, the tales contained in this volume could not be published with Randolph's four great collections of Ozark material published in the 1950s. and have till recently been circulating only in manuscript and on elusive microfilm. Just the book to give your grandmother — if she's the kind of lady who slaps her thighs and laughs out loud. With this one, she's sure to wake the neighbors. (*Warning:* please refrain from ordering this item if you intend to return it with a holier-than-thou letter. Sanctimony should be its own reward.)
Paperbound. No. 3646 $4.95

GOOD MOVIES

by Sheila Benson

MY LIFE AS A DOG

The very special Swedish import, **MY LIFE AS A DOG**, directed by Lasse Hallstrom, takes the extreme geography of childhood as its natural turf. Its hero is a button-eyed 12-year-old, his hair a warring collection of cowlicks, his behavior enough to try the patience of an oyster. As his mother's grave illness progresses, he is sent off in the company of a young uncle in the country — in what will become a landmark summer. Utterly unexpected, beguiling, insightful, sad, beautiful and quietly funny, **MY LIFE AS A DOG** ranks with **Forbidden Games** as one of the indelible portraits of childhood.

★ ★ ★

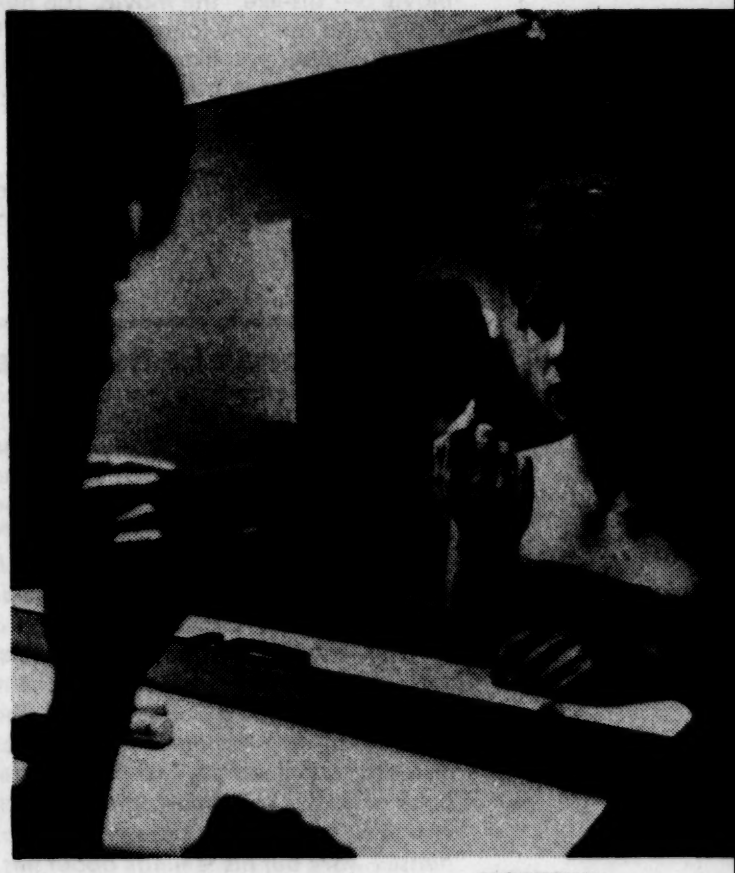
HOLLYWOOD SHUFFLE was made for approximately $110,000 and there's no denying it looks it. It has lulls in its comic inventiveness and potholes in its plot. But it is real, warm, terrifically endearing and its director/writer/producer/star Robert Townsend is a force field impossible to resist. And under his skits and fantasies is a desperately real dilemma gently stated: How does a black actor retain his equilibrium, much less his pride, while doing the Hollywood Shuffle? As you watch, you may be reminded that Woody Allen started almost as precipitously.

★ ★ ★

Working-class British playwright Joe Orton had a career with the trajectory of a Fourth of July rocket, fast, brilliant, astonishing, with a plunging drop-off when Orton was murdered by his male live-in lover. **PRICK UP YOUR EARS** was directed by Stephen Frears (**The Hit, My Beautiful Laundrette**) with Gary Oldman (Sid of **Sid and Nancy**) as Orton and Alfred Molina as his roommate. You may not be entirely sure why this short and compulsively merry life is being spread out for our perusal, however there is no denying its bitchy appeal, nor the brilliance of its principal actors, along with Vanessa Redgrave as Orton's celebrated literary agent.

★ ★ ★

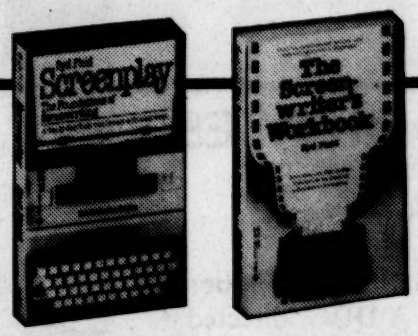
PRICK UP YOUR EARS



WORKING GIRLS

Lizzie Borden proves two things definitively in **WORKING GIRLS**, her serio-comedy which takes place during 16 hard hours in an upscale Manhattan brothel: that a no-holds-barred look at this life can be done without being the least bit erotic, and that Borden is a fine and sensitive director. Outstanding among the stable of "girls" are Louise Smith, and Amanda Goodwin as the small, blonde feisty one who "was always a whore but never a groupie." ■

Screenplay
• Screenwriter's Workbook



A nuts-and-bolts approach to creating a screenplay. The book benefits greatly by its detailed references to successful examples — particularly Robert Towne's script for Chinatown. *Author Syd Field is a Hollywood insider who doesn't question the system, but frankly explains how a movie is structured and why. At times he sounds like an old-school studio mogul knocking sense into some artsy-fartsy literary type. This quality makes* **Screenplay** *not only a valuable writing resource, but an instructive volume for film buffs, too.* —*Steven Levy*

There's also a companion volume, set up as a workbook. You'll probably want to read both. —*J. Baldwin*

Screenplay
(The Foundations of Screenwriting)
Syd Field
1984; 246 pp.
$7.95
($8.70 postpaid) from:
Dell Publishing Company
6 Regent Street
Livingston, NJ 07039
or Whole Earth Access

The Screenwriter's Workbook
Syd Field
1984; 211 pp.
$7.95
($8.70 postpaid) from:
Dell Publishing Company
6 Regent Street
Livingston, NJ 07039
or Whole Earth Access

•

The standard screenplay is approximately 120 pages long, or two hours long. It is measured at one page per minute. It does not matter whether your script is all dialogue, all action, or both.

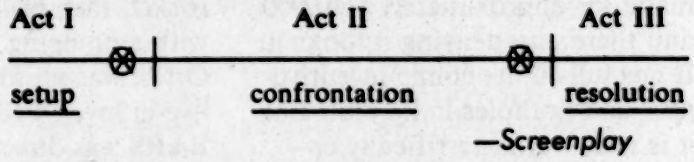
The rule holds firm — one page of screenplay equals one minute of screen time. The beginning is Act I, referred to as the *setup*, because you have approximately 30 pages to set up your story. If you go to a movie, you will usually make a decision — either consciously or below the level of awareness — about whether you "like" the movie or "dis-like" the movie. The next time you go to a movie, find out how long it takes you to make a decision about whether you like the film or not. It takes about ten minutes. That's ten pages of your screenplay. You've got to hook your reader immediately. —*Screenplay*

•

The PLOT POINT is an incident, or event, that "hooks" into the action and spins it around into another direction. *It moves the story forward.*

The plot points at the end of Acts I and II *hold* the *paradigm* in place. They are the anchors of your story line. Before you begin writing, you need to know four things: ending, beginning, plot point at the end of Act I, and plot point at the end of Act II.

Here's the *paradigm* again:



—*Screenplay*

Adventures in the Screen Trade

This is one of the three most engrossing "creative confessional" books I've ever read. (The other two are **The Years With Ross** *by James Thurber and* **Act One** *by Moss Hart.) William Goldman, a very skilled storyteller, wrote several of the most well-known films of the past 18 years — including* **Marathon Man**, *part of* **All the President's Men**, *and* **Butch Cassidy and the Sundance Kid**. *One third of the book talks about the roles of Hollywood filmmaking: how a film is affected by the star, the producer, the writer, and the other players. The next third tells the story of each film in Goldman's life; the final third takes you step-by-step through the making of* **Butch Cassidy**, *including a presentation of the full screenplay. This is a book of gossip with heart, gossip specifically chosen to enlighten you (and, it's pretty clear, to help Goldman himself work out his feelings about this business).*
—*Art Kleiner*

Adventures in the Screen Trade
William Goldman
1983; 594 pp.
$12.50
($13.50 postpaid) from:
Warner Books
P. O. Box 690
New York, NY 10019
or Whole Earth Access

•

Why did Universal, the mightiest studio of all, pass on *Star Wars*, a decision that just may cost them, when all the sequels and spinoffs and toy money and book money and video-game money are totaled, over a *billion* dollars? Because nobody, *nobody* — not now, not ever — knows the least goddam thing about what is or isn't going to work at the box office.

•

Okay, let's set about trying to get an agent.

(1) You better have something written that's as good as you can do. A screenplay, in proper form and — don't laugh — legible. If you have more than one screenplay, better yet. Not that you're going to show the agent two, not at the beginning. But if he reads one and is at least intrigued, he's liable to ask for another sample of your work.

(2) Find out who and where the agents are. How? Easy. Contact the Writers Guild of America, either the East Coast branch in New York or the West Coast branch in Los Angeles, and acquire their list of accredited agents. I am looking at such a list now. It is dated July 1981 and it is nine pages long and lists, I would guess, the names, addresses, and phone numbers of at least two hundred agents.

(3) Study the list. Really go over it and over it. Bewildering, but keep at it. On the first page, for example, there are only five entries. "Agency for Artists" — forget about them for now; and the same, again for now, with AAG — Artists Agent Group. But "Adams, Limited, Bret" — that may be of value. Bret Adams is a name. And that's what we're tracking down now — names.

Because any point of contact, no matter how distant, is infinitely preferable to no contact at all.

The T.V. Scriptwriter's Handbook

A quick take would have you believe that T.V. scriptwriting and screenwriting for film are about the same. Superficially that's true of course, but in detail it isn't. At least it isn't as practiced these days. Here are the tricks of the trade, and the requirements. That's right, requirements — there's a formality to it all, a specific way that the script has to be presented. Maybe this is one reason so many shows look alike? Anyway, there is a lot of hard-won experience here. If you would break into T.V. scriptwriting, you'd better pay attention. —J. Baldwin

[Suggested by Barbara Weismann]

The T.V. Scriptwriter's Handbook
Alfred Brenner
1980; 134 pp.
$9.95
($11.95 postpaid) from:
Writer's Digest Books
9933 Alliance Road
Cincinnati, OH 45242
or Whole Earth Access

•

A scene merely illustrating character that does not advance the story must be either changed or eliminated.

A television treatment or script then consists of a series of scenes. Each scene is like a link in a chain. It contains conflict, develops character, and moves the story one step forward. As you develop your plot, check each of your scenes. Does it accomplish its purpose? Does it contain the necessary elements? Is it essential to the overall drama?

•

The treatment is a scene-by-scene narration of the entire plot of the teleplay from beginning to end.

It is written in prose, in the present tense.

A treatment may contain some dialogue. I believe, however, that direct dialogue in a treatment should be avoided. I learned years ago that any line of dialogue in a treatment may jar some reader or executive, rub him the wrong way, and cause him to quibble with it and reject the entire story. Don't give them anything specific to reject until you have to. Hold off on dialogue until you actually write the script.

Script City

Script City is the company to go to for the original scripts of hundreds of movies, TV movies, TV episodes, as well as books about how to write scripts, how to sell scripts, and the movie biz in general.

I bought a copy of the script for my favorite movie, ***Red Dawn****, from them. Looking through the script, I almost had a spasm. The original script held together a lot better and told a far more coherent story than the final product. If nothing else, I reappraised John Milius, the director, pretty thoroughly.*

If you want to write a movie script on a subject that has had several movies made about it already, procuring copies of the scripts of these movies might save your brainchild from being bounced for being too like a previous effort.

Script City also sells pictures of stars, movie posters and lobby cards for the fanatical film fans out there.

—Eric Oppen

The Corporate Scriptwriting Book

For the Roxie, it's not. Short and sweet for a captive audience, it is. Ten minutes at the most, aimed at increased sales, morale improvement, skill training or stockholder joy. Might be a slide show, video or film. Here's how it's done. Judging by the awful presentations I've seen, the skills involved must be elusive. This book should help.

—J. Baldwin

[Suggested by Charles Chesney]

The Corporate Scriptwriting Book
Donna Matrazzo
1985; 207 pp.
$14.95
($16.45 postpaid) from:
Communication Publishing Company
548 NE 43rd Avenue
Portland, OR 97213
or Whole Earth Access

•

"Talking Head." The "Talking Head," which is a shot of a person talking directly to the camera, is perhaps the most misused and over-used of all frameworks. Talking heads should only be used for significance — of the person, the message, or both. More important, they should only be used for very brief periods. Fifteen seconds or less is fine, 30 seconds gets to be boring and 60 seconds (or more!) is inexcusable.

•

Length is another critical area. It's been said that there ought to be a "10 Minute Rule" for in-house productions, that no program should be longer than ten minutes. About that time, audiences begin to squirm in their seats. If your show lasts much longer than that, it must be very powerful or snappy to hold their attention.

Ten minutes is a long time. It's equivalent to *twenty* television commercials and one-third of the evening news. Handled well, almost anything can, and often should, fit into ten minutes.

Scriptor

This formatting program greatly reduces the hassles involved in putting your already-word-processed screenplay into the standard form required by the industry. ***Scriptor*** *takes care of such bothers as page-breaking, pagination (and maddening repagination if you change anything), margins, continueds and the like.* ***Scriptor*** *doesn't leave any weird codes on your finished work either.*

—J. Baldwin

SCRIPTOR: Screenplay Systems. $295. Copy-protected. IBM compatibles, CP/Ms, and Macintosh. Screenplay Systems, 150 East Olive Avenue, Suite 305, Burbank, CA 91502.

Script City
Catalog
$1 from:
Script City
1765 N. Highland Avenue
Suite 170-WE
Hollywood, CA 90028

The Desolate City • Christianity and the World Religions

Despite the massive changes that have occurred in the Catholic Church since Vatican II, it seems like the only Catholics I run into are ex-Catholics. Thus the Church finds itself in a dilemma: it has not changed enough to please those who consider it irrelevant, while it has changed too much to please those who liked the old ways best.

Anne Roche Muggeridge is definitely aghast at the changes that God's servants hath wrought. Her book, ***The Desolate City*** *(subtitled:* ***Revolution in the Catholic Church****), is her stinging indictment of those within the Church who have led it far from the comforting days of her youth when Rome's authority was absolute. Yet to write this book off as merely a peevish screed is to miss the chance to witness a top-notch intelligence arguing an unpopular but utterly logical position. Muggeridge has a sarcastic streak that relishes a good twist of the knife, but she is also sincere in her orthodox faith and not embarrassed to show it. This is a book well worth reading, especially if you can't imagine anyone making a passionate case for conservative Catholicism.*

Hans Kung is one of the contemporary theologians who earn a lambasting in ***The Desolate City****, and I'm sure that his new book* ***Christianity and the World Religions: Paths to Dialogue with Islam, Hinduism, and Buddhism*** *drives the nails in his coffin as far as Muggeridge is concerned. In each of the book's three parts, a professor from a German university provides an excellent summary of the practices and worldview of a major world religion. Hans Kung then provides a "Christian response" which contrasts that religion with Christianity, finds points of agreement as well as points of divergence, and probes into what both can tell us about religion itself. The Christianity presented here is generally ecumenical, and its openness to the value of non-Christian religious paths is impressive. Best of all, the translation from the German is a pleasure to read. A book like this may be bad for Catholicism, as Muggeridge would have it, but on its own terms it is a tour de force for human understanding.*

—Jay Kinney

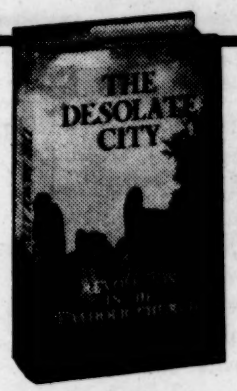
•

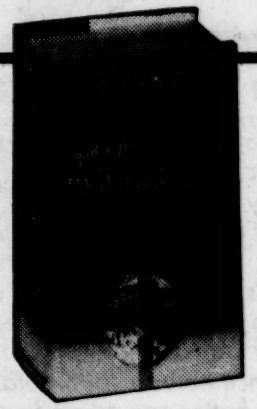
Any stick will do to beat the Catholic Church with, as Ronald Knox observed; throughout the 1940s and 1950s Teilhard was the really big stick in media and academic anti-Catholic polemic. He served the simple, traditional purpose of the Church's enemies, to inflict as many-coloured a shiner as possible.

The Church's treatment of Teilhard became the latest link in the catena of grievances, a worthy addition to Galileo and the Inquisition. (I remember in particular a certain Catholic-baiting professor who had for years tormented me about Teilhard scrambling gleefully over a pile of firewood I was stacking in his eagerness to brandish before my eyes the first English edition of *The Phenomenon of Man*. I wish I had flattened him with the chunk of maple I was holding throughout his loud triumph.) *—The Desolate City*

•

Commenting on the transformation of religious orders in the United States, the American historian of the Catholic revolution, James Hitchcock, remarked that "a literal self-worship has now replaced the worship of God among nuns in the United States." Before Vatican II, nuns were totally committed to the traditional eschatological world view. I remember with awe from my several years as a novice in a religious order the intensity of their sublimation of natural maternal yearnings and the energy and passion it lent to the work of the Church. The shock of the revolution was too much for many of them to bear.





The Desolate City
Ann Roche Muggeridge
1986; 219 pp.
$16.95
($18.45 postpaid) from:
Harper & Row, Publishers
2350 Virginia Avenue
Hagerstown, MD 21740

Christianity and the World Religions
Hans Kung et al.
1986; 460 pp.
$19.95
postpaid from:
Doubleday & Company
501 Franklin Avenue
Garden City, NY 11530

Their souls became like the empty house into which wandering devils enter and dwell. There is a real stink of brimstone at gatherings dominated by feminist nuns, especially at their liturgies, a creepy neo-paganism with strong suggestions of sexual perversion. This is no longer a secret; Mary Daly, an early radical who has left the Church but still teaches at the Jesuit Boston College, openly teaches lesbian witchcraft. Recently, a collection of confessions, called *Lesbian Nuns: Breaking Silence*, quickened the heartbeats of the pious readers of the pornographic magazine *Forum*, to which its feminist publishers peddled it. *—The Desolate City*

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Lest there be any misunderstanding, I am not recommending to Islam the modern technological/technocratic "success story," which has long since become problematic for Westerners and which has so often perverted instrumental reason into unreason, technological mastery of nature into devastation of nature, and enlightenment into human enslavement (to science, technology, the economy). The constant menace of atomic war and possible self-destruction have opened many eyes. Nor am I urging Islam to adopt the pseudovalues of a self-indulgent Western culture as "progress." Instead, Islam and Christianity should jointly (so far as possible) maintain a critical distance from technological and scientific developments, so as to disenchant those agents of (Weberian) disenchantment, in the name of the one true God; not to reject them, but to rediscover their potential for making life more peaceful and humane, and to integrate them into a radically different understanding of religion *and* technology. "Postmodernity," whose consequences are by no means clear for Christianity, either, would then constitute a common challenge for both Christian and Islamic theology. *—Christianity and the World Religions*

•

The myths of India, at once veiling and unveiling the cosmos, cannot simply be dismissed by Christians as superstition or unbelief. They can open up a path for Hindus and possibly for Christians as well to the myths of the "Divine," to God himself.

Nevertheless, the myths of India should not be passed on without examination by either Christians or Hindus as the sole possible expression of their faith. They have to be submitted, in a sympathetic manner, to a critique of their substance, which could be conducted from the standpoint of Hinduism itself (that of the *Gita*, say) or of secular analysis of religion and ideology, or of the Christian message. *—Christianity and the World Religions*

The Rapids of Change

I figure that if I make it to my nineties, which will mean that, against all odds, there's still a world, it will be thanks to the kind of local/cultural/civilizational understanding and millenial engagement driven at in Robert Theobald's ***Rapids of Change****. This guy is a planetary organizer and wisdom fount of Margaret Meadish scope and stature who goes about his work in a much more cooperative way than she did.*

In all his socratic teaching over the last twenty years, Theobald has harkened to and insisted on these values: honesty, responsibility, humility and love, and a respect for mystery — as basic to any effort to make it into the next century and beyond.

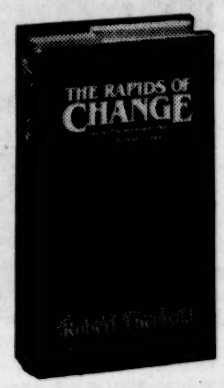
Because his work is true meta-communication, and none of us has experienced very much of that yet, Theobald remains strangely unsung and has never made it on the ecointelligentsian Newquarian Age circuit. But he really plays in Peoria because he and the Peorians know that unless values-based responses to our age of crisis spring from local efforts, they will be rejected as exogenous grafts.

With the participation of a wide web of friends and collaborators, Theobald reports out a continually evolving synthesis: the problems and possibilities arising out of current trends. All this learning endeavor crystallizes in ***The Rapids of Change****, a confoundingly nonprescriptive guidebook on us saving the planet and ourselves.*

—Stephanie Mills

•

Ayn Rand is one author who has challenged people to take an autonomous stand to recognize their own potential. Regrettably, she has largely destroyed the positive value of her work by failing to recognize that empowered individuals should seek to work with other competent people rather than maintain power over them.



The Rapids of Change
Robert Theobald
1987; 254 pp.
$16.95
postpaid from:
Knowledge Systems, Inc.
1111 West Morris Street
Indianapolis, IN 46231

We have now learned that nothing important can be achieved today without working *with* others. The stronger an individual, the less necessary it is for him or her to show power, because it will be visible in both thought and action patterns.

•

There is a widespread tendency to equate the situation in the eighties with that of the fifties. I am often told when I go on campuses that students are apathetic. Apathetic people see no reason to change because the world in which they live seems satisfactory to them. This *was* the situation in the fifties when social structures seemed appropriate to most of the population even though reformers found them dangerous and destructive. So the first step toward change in the sixties was to challenge these structures, so that people would "see" what was wrong about segregation and the Vietnam war.

Today, on the contrary, students and adults are already frustrated, baffled, and angry, and therefore ready to listen to those who propose new directions. We no longer need to stir people up; rather, we need to show them how to make sense of their lives and believe in their ability to effect change.

Finite and Infinite Games

A whole bunch of our readers recommend this book — a rare event here at ***WER****. I found the book to be a rousing combination of insight and glib New Age word-twisting. But when I attempt to discuss the book with friends who have read it, there doesn't seem to be any agreement as to what parts are fresh air and what parts are horse exhaust. That's usually a sign of a book worth reading.*

—J. Baldwin

[Suggested first by Shoshana Tembeck]

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Finite players play within boundaries; infinite players play with boundaries.

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Inasmuch as a finite game is intended for conclusion, inasmuch as its roles are scripted and performed for an audience, we shall refer to finite play as *theatrical*. Although script and plot do not seem to be written in advance, we are always able to look back at the path followed to victory and say of the winners that they certainly knew how to act and what to say.

Inasmuch as infinite players avoid any outcome whatsoever, keeping the future open, making all scripts useless, we shall refer to infinite play as *dramatic*.

Dramatically, one chooses to be a mother; theatrically, one takes on the role of mother.

•

Property is an attempt to recover the past. It returns one to precompetitive status. One is compensated for the amount of time spent (and thus lost) in competition.

•

Infinite players never understand their culture as the composite of all that they choose individually to do, but as the congruence of all that they choose to do with each other. Because there is no congruence without the decision to have one, all cultural congruence is under constant revision. No sooner did the Renaissance begin than it began to change. Indeed, the Renaissance was not something apart from its change; it was itself a certain persistent and congruent evolution.

For this reason it can be said that where a society is defined by its *boundaries*, a culture is defined by its *horizon*.

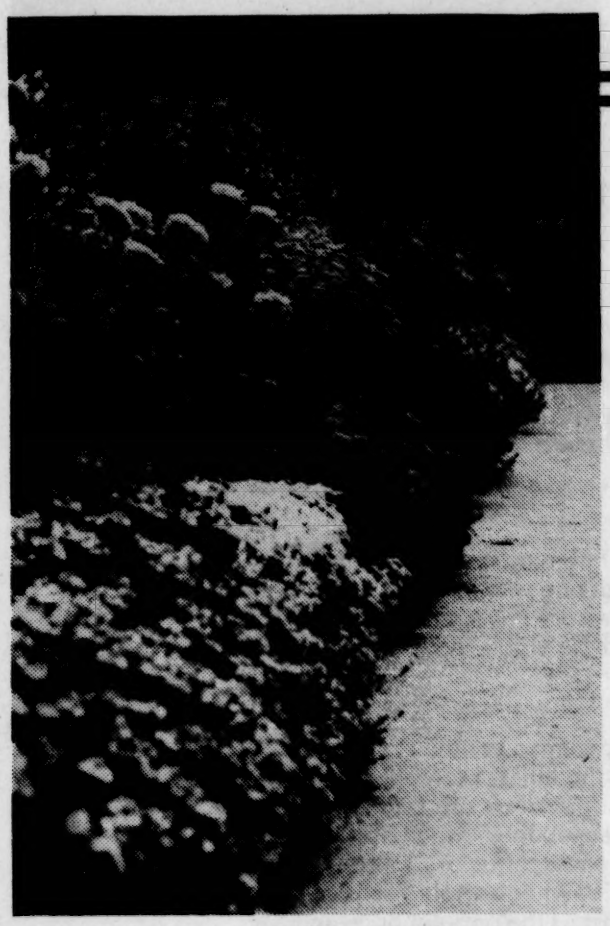
•

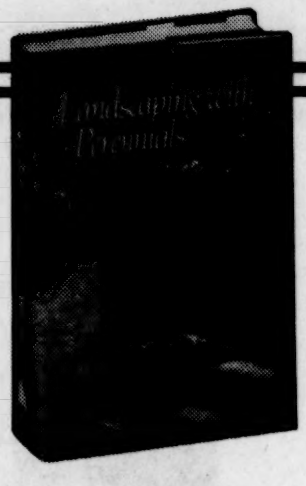
We do not go somewhere in a car, but arrive somewhere in a car. Automobiles do not make travel possible, but make it possible for us to move locations without traveling.

•

The speech of New Yorkers resonates not because they talk like New Yorkers, but because when they talk we hear New York in their voice.

Finite and Infinite Games
(A Vision of Life as Play and Possibility)
James P. Carse
1986; 152 pp.
$13.41
postpaid from:
The Free Press Division
of Macmillan, Inc.
866 Third Avenue
New York, NY 10022





Landscaping with Perennials
Emily Brown
1986; 304 pp.
$34.95
postpaid from:
Timber Press
9999 S.W. Wilshire
Portland, OR 97225
or Whole Earth Access

A border at Filoli Center is longer and broader than any which you could put in a small yard. The size offers great opportunity to associate shrubs, sub-shrubs, and mature perennials. The garden has passed through its developing years; some of the genera have been divided and replanted several times.

•

Landscape architects often make the strips along paths too narrow allowing so little room for soil that there is little scope for choices. Perhaps there is only room for one row of a small perennial which may well look skimpy. Recall some of the suggestions for perennials adaptable to row planting in the discussion of narrow strip beds. The upright *Thymes* especially the spp. with natural rounded forms may be improved with a little clipping. But do not take the design of a landscape architect lying down, widen the strip a bit. If you build a house yourself and have an architect, keep him out of the garden except in rare cases. He does have to fit the building comfortably onto the lot but have your plan for paths and plantings ready for him to take into account as part of the site with which his plan must harmonize.

Landscaping with Perennials

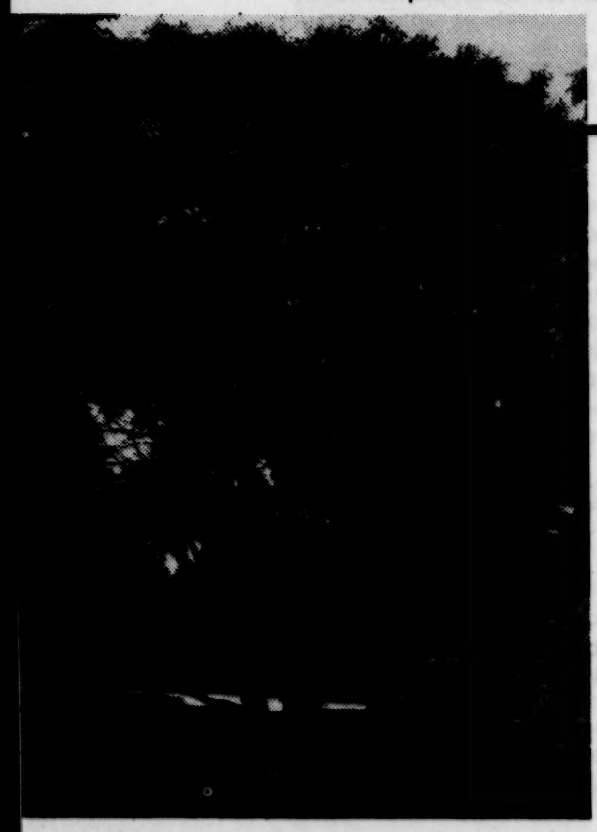
If you are looking for an idiot-proof book on perennial gardening, this isn't it. Emily Brown is well into her eighties, and what she has to share is a lifetime of experience and opinion. Her quirky style moves along at a pretty good clip, too — even the table of contents and the (in this case essential) index don't always keep up with everything that's buried in the text. But for anyone willing to dig a bit, here is a wealth of specific information, usually right down to which cultivar of a plant species she prefers, and why. The text is interspersed with lengthy plant description lists, making this as much a book for reference as reading. Those with short attention spans or an impending growing season should head straight for the plant lists and perennial bed designs at the back of the book.

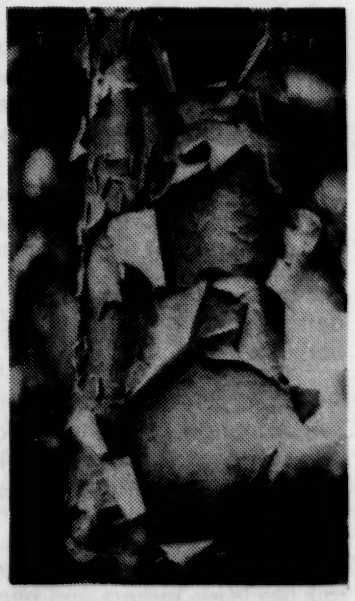
—Richard Nilsen

•

You might be tempted to plant too close so that the border will look full right away. If you can't resist the temptation, you will have to remove and replace the first year. You can forestall replacing if you can decide to leave space for growth. A rule of thumb? Leave 6 inches for those you believe are upright growers and restrained growers, leave 12 inches for those which promise to become wider. You should leave more space between drifts than between plants. Somebody said, "A community of plants comfortably adjusted to one another, cooperating instead of co-elbowing."

Strip planting has a tendency to be unexciting. Consider choosing a perennial with variegated leaves, to provide liveliness and color while the plants are out of bloom. For a strip of accommodating width, *Iris pallida* is a good selection. Here it is grown in a full and flourishing row.





***Acer griseum* (paperbark maple).**

Plants That Merit Attention

"There is no perfect tree. However, there are many little known trees with superior characteristics that merit attention." So begins this masterful display of 143 trees useful for landscaping. Like cars or clothes, the nursery business is subject to fads. The laws of the marketplace further limit what is for sale. If 20 tree species account for 80 percent of sales, then many wonderful species don't get propagated at all.

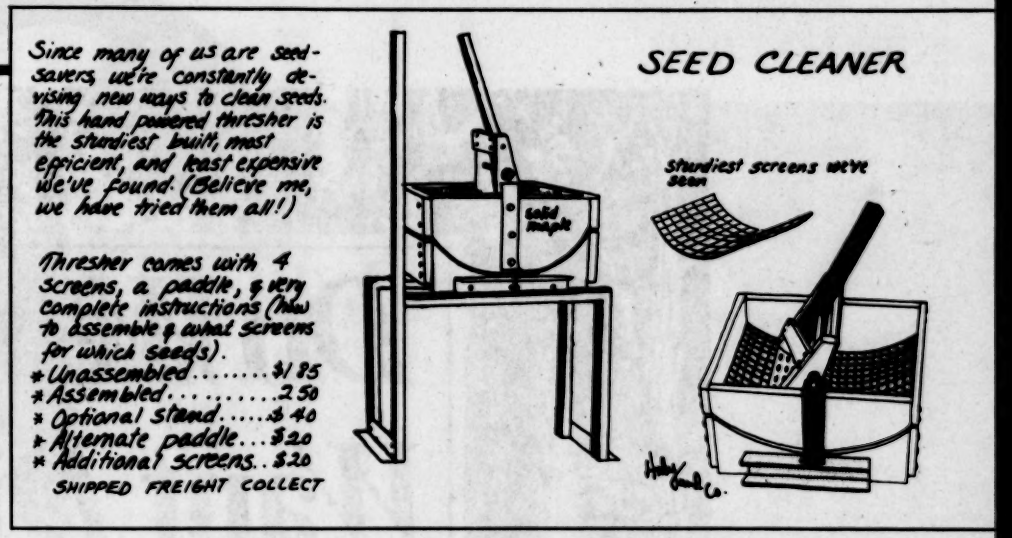
To help remedy this situation, the Garden Club of America has begun the ***Plants That Merit Attention*** *series (other volumes are forthcoming). This tree volume has*

Seeds Blüm

Seeds Blüm specializes in teaching their customers how to grow and save seed from the heirloom vegetable varieties they sell. The result is good eating and the preservation of worthy but endangered vegetables. Heirloom varieties tend to have qualities like flavor and tenderness that have been bred out of hybrid strains to favor the demands of mechanized agriculture. As a home gardener, would you rather grow an old-fashioned tomato with so much sugar it practically bursts before you can get it to the kitchen, or a new hybrid that could be kicked there without damage? Most importantly, would you rather buy open-pollinated varieties that let you eat the fruit, save the seed and grow your own the next year, or a hybrid that forces you to buy the seed year after year? This is the only vegetable seed catalog I've ever seen that sells a seed cleaner as one of its products.

This catalog is graphically disheveled, friendly in tone, and amazingly interactive. There are five different categories for growers interested in exchanging seeds and/or information back to Seeds Blüm. You could say that this is a network being run as a business. It's important business, and it's a unique catalog.

—Richard Nilsen



Seeds Blüm
Catalog
$2 from:

Seeds Blüm
Idaho City Stage
Boise, ID 83706

Ames' Orchard & Nursery

Four-color fruit tree catalogs are fun to look at but they never describe the real world. The buds never freeze, the bugs never bite and the boughs hang heavy with perfect fruit. Ames' Orchard & Nursery is a small business that is strong on informed personal service, and has a black-and-white catalog that doesn't let salesmanship get in the way of honest information. They feature apples on the most disease-resistant rootstocks available, and also carry peaches and assorted berries and grapes. The trees are adapted for conditions east of the Rocky Mountains, and prices are reasonable. *—Richard Nilsen*

Ames' Orchard & Nursery
Catalog **$ .22** stamp from Ames' Orchard & Nursery
6 East Elm Street, Fayetteville, AR 72701

•

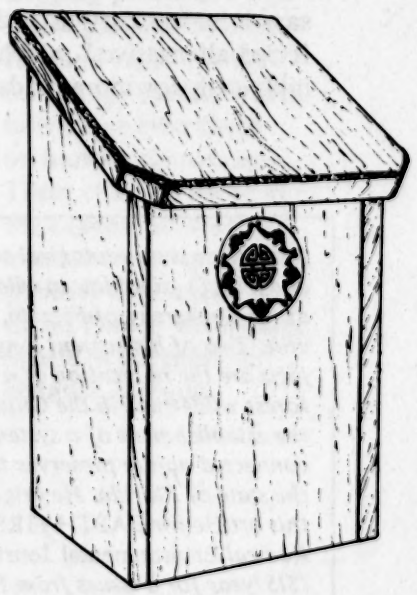
In a sense, "information" has been bred into a disease-resistant plant. They are better "genetically informed" than non-resistant plants. So we think of ourselves as information brokers as well as nurserymen. Accordingly, we will do our best to augment our plants' "information" by answering specific questions concerning fruit diseases, pests, nutrition, etc. (please enclose SASE with inquiries).

Bat Houses

Bat Conservation International has plans for bat houses, videocassettes about bats, and a newsletter. They also sell a ready-made bat house; it looks like a birdhouse except there is no round hole in the side and no floor in the bottom. Inside are vertical slats where bats can nest. Why encourage bats as neighbors? Because they are prodigious mosquito-eaters, far surpassing purple martins and even those noisy black-light bug zappers that can change a dark, starry evening into a science-fiction stage set. Your average bat is capable of eating 500 mosquitoes an hour.

Another thing to realize about bats is that the connection between bats and rabies has been mythologized out of all relation to the facts, and that pest control companies have a vested interest in keeping that fear rampant. Some facts are helpful: during the last forty years in the U.S. and Canada, fewer than a dozen people have died from rabies transmitted by bats. In that same period, more than 130 people have died from rabies transmitted by dogs and cats. As a comparison, more than a dozen people die each year from bee stings, or from dog attacks. Dogs and bees have positive value and we make allowances for their possible negative effects. Bats are also valuable, and Bat Conservation International acts as their advocate. *—Richard Nilsen*

Bat House
$32.70
postpaid from:
Bat Conservation
International
c/o Brackenridge
Field Laboratory
University of Texas
Austin, TX 78712



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Bat houses have become more important as bats lose their natural and man-made roosts in old trees, buildings and caves. . . .

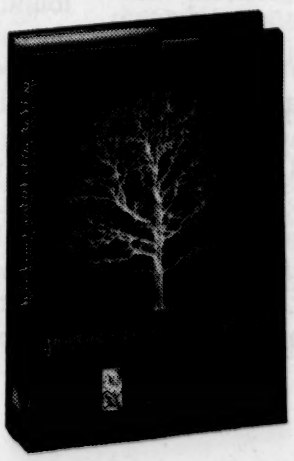
Designed for North American bats, the house is constructed of ¾" rough-sawed western red cedar, a long-lasting wood which will withstand the elements.

everything from the 50-million-year-old dawn redwood to the Professor Sprenger crabapple, about which it says: "One of the best ornamental trees in North America . . . It is hard to understand why this tree is not available in the trade. One commercial grower objected to its name; if necessary the name should be changed."

Each tree gets a two-page spread with color photos and relevant information, including hardiness zones and places where specimens may be visited.

—Richard Nilsen

Plants That Merit Attention
The Garden Club
of America
1984; 352 pp.
$44.95
($47.95 postpaid) from:
Timber Press
9999 S.W. Wilshire
Portland, OR 97225
or Whole Earth Access



Do We Really Want Diversity

by Reed F. Noss

MANAGING FOR DIVERSITY" is the code of today's land managers, but in many cases "managing for weeds" would be a more accurate description of what actually goes on in the field. Our love for diversity, friends, is an ecological trap.

Conservationists often speak loftily of preserving "biological diversity" and "genetic diversity" as if the meaning and application of these concepts were self-evident. In reality, the scale and content of biological diversity are often far from clear.

More than one conservationist has been horribly surprised when the concept of diversity has been used against him by those who would convert our last natural areas into economic production units. The U.S. Forest Service is presently preparing land and resource management plans for all of the national forests, and one would hope that maintaining a diversity of wildlife in the forests would be a major objective of these plans. The Forest Service says it is. But curiously, the "preferred alternative," which invariably calls for more roads, more intensive silviculture, and increased timber harvest, is also considered to do the most for wildlife diversity.

How could this be? Is the Forest Service Lying to us? In this case, probably not. When a forest is fragmented by roads and clearcuts, the resulting patchwork of habitats is almost always richer in species than the original, unfragmented forest. In addition to climax forest species (many but not all of which dwindle away after fragmentation), species dependent on early successional habitats often thrive under intensive forest management regimes. This is the perverse logic of the maximum diversity concept: bring in humans, roads, and machines, rip apart the old growth, and we will have all the more species. Good old human progress and wildlife working together!

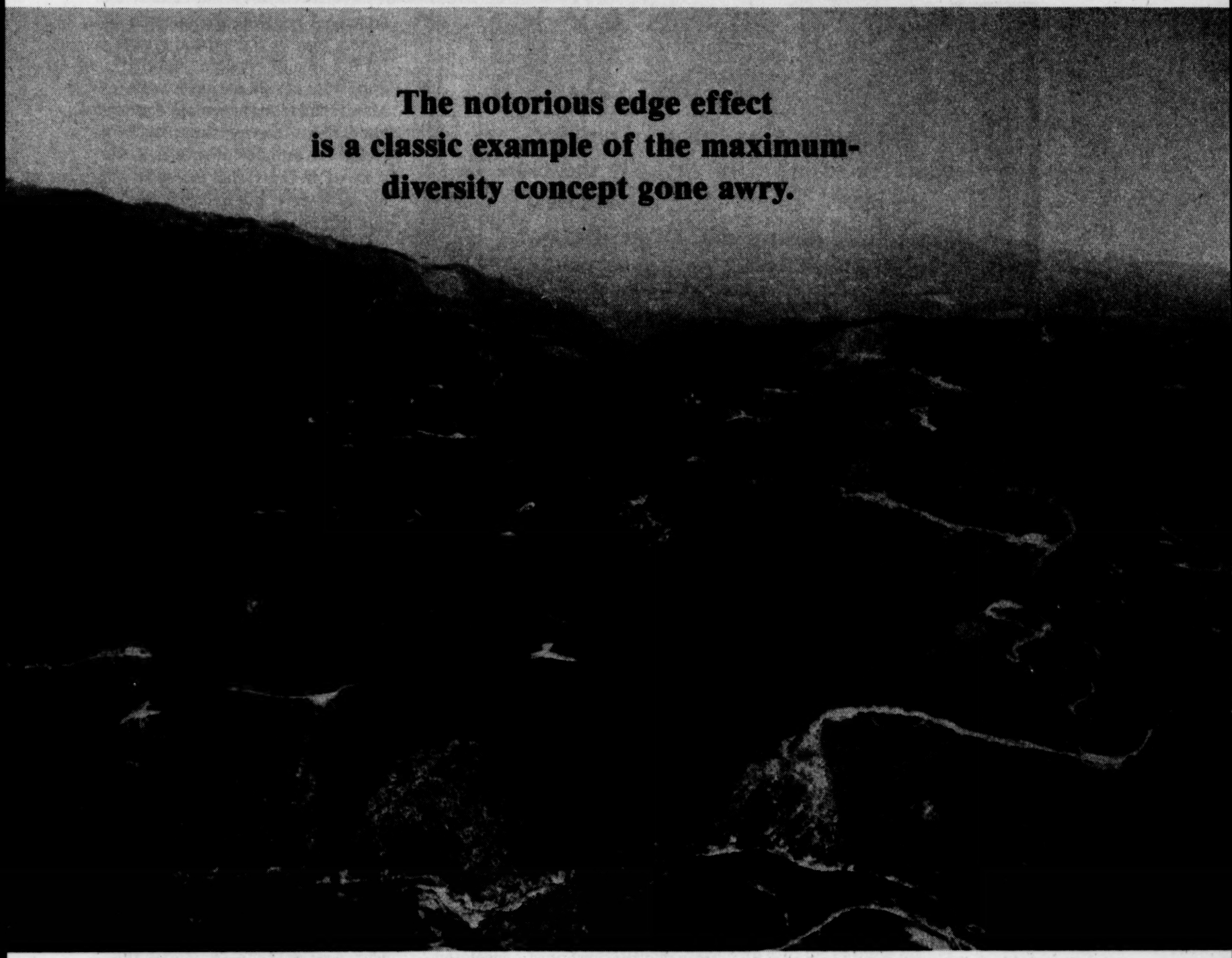
But wait, friends, the story is much more complicated than the Forest Service and other manipulative land managers would have us believe. We cannot deny that human disturbance will often increase the *number* of species within single management units or even entire forests. But what about the *identity* of those species? The kinds of species that benefit from human disturbance are primarily plant and animal weeds. They are opportunistic generalists that get along just fine in the human-dominated agricultural and urban landscapes that surround our remaining natural areas. Opportunistic weeds do not need forests, parks, or preserves for survival.

On the other hand, the species that disappear from fragmented and human-disturbed forests are those we can least afford to lose. These are wilderness species, wide-ranging animals with large area requirements, and other organisms sensitive to the intrusions of men and machines. These sensitive species cannot usually survive without large nature reserves.

Examples of weedy species proliferating in disturbed areas and increasing overall diversity abound. A recent study in the New Jersey Pine Barrens focused on the effects of water pollution derived from residential and agricultural development. More species of aquatic macrophytes (vascular plants) were found in the polluted sites than in the unpolluted sites. But guess what? The polluted sites were dominated by marginal or nonindigenous species that are common to wetlands throughout the eastern United States. The unpolluted sites — though less diverse — contained a unique and distinctive Pine Barrens flora that is disappearing as land is developed in the region.

Reed Noss is an ecological consultant and a Ph.D. candidate in wildlife ecology at the University of Florida, Gainesville. Two of his current long-range projects are the re-creation of a deciduous forest wilderness in the Ohio Valley and the establishment of a system of interconnected nature preserves throughout the state of Florida. He originally wrote this article for EARTH FIRST! The *Radical* Environmental Journal *($15/year for 8 issues from P. O. Box 5871, Tucson, AZ 85703).*

—Richard Nilsen



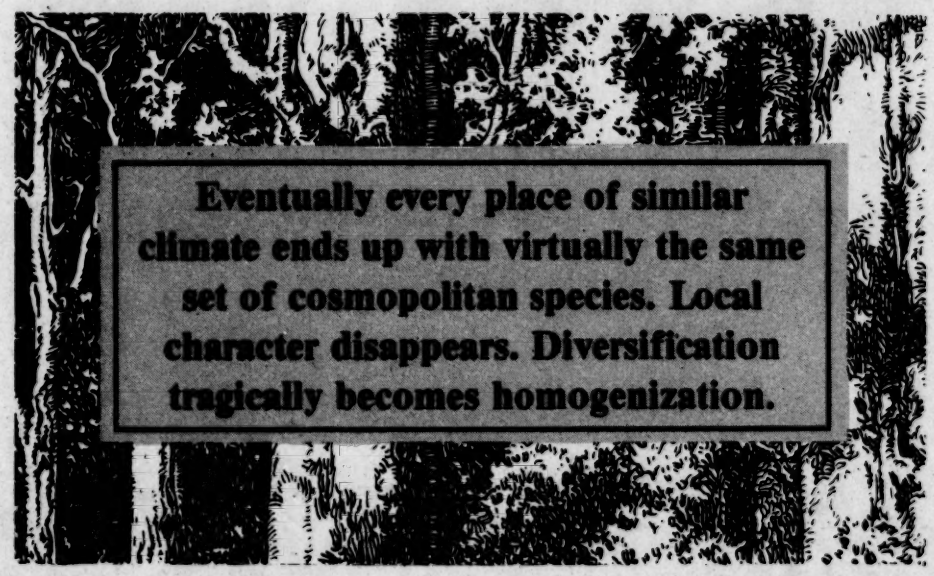
The notorious edge effect is a classic example of the maximum-diversity concept gone awry.

Human trampling in the vicinity of trails is another diversifying factor. Many studies have documented that trails create new microhabitats in their vicinity, leading to an increase in the number of plant species. Many of the new species probably "hitch-hiked" in as burrs on the pantlegs of hikers. But what about the rare and attractive orchids that are plucked by hikers who gained access by the trail? Are we willing to trade one rare orchid species for a dozen cosmopolitan weeds? And what about the animals that are disturbed by the frequent presence of hikers along the trail? In conservation, it is generally a mistake to treat all species as equal. We must focus on those species that suffer most from human disturbances.

The notorious edge effect is a classic example of the maximum-diversity concept gone awry. Wildlife biologists early in this century (particularly my ideological hero, Aldo Leopold) noticed that edges — the places where distinct species meet — are often richer in species than either of the adjoining habitats. This was explained by observations that edges contain animals from both of the adjoining habitats, animals that need both kinds of habitat for their life functions, and other animals that actually specialize on edges. Edges were found to be especially productive of certain favored game species like rabbits, pheasant, and bobwhite quail.

With all these tantalizing benefits

Logging practices often create patterns of clear-cuts and regrowth that favor edge species which tolerate or even thrive on human disturbances. These changes occur at the expense of sensitive interior forest species. (Above) Willamette National Forest, with Three Sisters Wilderness in distance, Oregon.



of edges before their eyes, wildlife managers set out to create as much edge habitat as they possibly could. "Managing for diversity" usually meant managing for edge. But not everyone can win with such a management regime. Edge species tend to be weeds, and the species of habitat interiors tend to disappear when habitat area is reduced to favor high edge-interior ratios in management units.

Edge effects include even more insidious processes. Edge habitat, often drier and denser than interior habitat, typically extends a considerable distance into the forest interior. Weedy species then invade from the edges to alter species composition throughout a small forest block. Forest birds suffer reduced reproductive success when nest predators (for example, grackles, jays, crows, and small mammals) and brood parasites (brown-headed cowbirds) move in from the edges. People and their domestic animals also invade natural areas from their perimeters.

A study I conducted in an Ohio nature reserve surrounded by suburbs and agricultural land found an extraordinarily high diversity of breeding birds. Unfortunately, the dominant species in this 500-acre reserve were the same ones that dominated the surrounding developed land. Typical forest interior birds of the region had very small populations in the reserve and were in danger of local extinction. Management for habitat diversity within the reserve (especially the maintenance of early successional habitats and numerous edges) intensified the biological deterioration.

Disturbance, of course, is fundamentally a natural phenomenon that provides suitable niches for a variety of native flora and fauna. Fire, windthrow, floods, landslides, and other natural disturbance events are responsible for maintaining environmental heterogeneity at multiple scales. Many wildlife species are dependent upon the early successional habitats created by disturbance for food and other critical needs. Some native species are "fugitives" that cannot compete in climax communities and survive only by dispersing among recently disturbed patches. Even the climax forest is diversified by small-scale disturbances such as treefalls. Many of the tree species we associate with old-growth habitat actually require multiple treefall gap episodes in their vicinity in order to reach maturity.

But the ecological mosaic created by natural disturbance is a far cry from the checkerboard of isolated habitats created by modern humans. The natural mosaic is interconnected — the artificial patchwork is fragmented. This is an important distinction for species that require large systems of continuous habitat for survival. Additionally, artificial habitat manipulation generally requires roads for access. Nothing is worse for sensitive wildlife than a road. Roads bring vehicles, guns, noise, and weeds. A bear (Smokey notwithstanding) can usually deal with fire, windthrow, and flood — but he is in big trouble when surrounded by drunken poachers with guns, dogs, and citizens' band radios.

The critical point in all this is that the diversity concept does not prescribe straightforward recommendations for conservation. A more diverse system, in terms of number of species or habitats, is not necessarily more valuable than a simpler system. A relatively depauperate system may be the natural system for the area of concern. Another important consideration is scale. Manipulative management for edge and habitat interspersion may *increase* the number of species at the scale of an individual forest or nature reserve, but *decrease* the number of species in the biogeographical region. This switch occurs when the managed area simply perpetuates those species that are common in the developed landscape, while the species most in need of reserves for survival are lost from the region. Species dependent upon large blocks of unfragmented habitat — wilderness — are the first to disappear.

If we carry this fragmentation process to its logical extreme, we end up with a bland and boring biosphere composed only of opportunistic weeds, those species that can adapt readily to human development. Eventually every place of similar climate ends up with virtually the same set of cosmopolitan species. Local character disappears. Diversification tragically becomes homogenization.

Ecologists are becoming aware of these diversity problems. But many foresters, wildlife biologists, park managers, and otherwise knowledgeable naturalists are being sucked into the trap of maximum diversity. Conservationists have been fooled and confused about what diversity means in context. They are unable to argue with the Forest Service's management plans that ostensibly maximize both hard commodities and wildlife. They are unaware of the divergent effects that a land management regime can have at different spatial and temporal scales. They think they are getting diversity, but they are really getting impoverishment.

I believe that conservationists do and should want diversity. We should strive to maintain every species in its rightful place on this Earth, and furthermore assure each species the potential to evolve as conditions change. But for any given area, the number of species or habitats alone is a poor criterion for conservation. What we want is the full complement of native species in natural or normal patterns of abundance. Call that native diversity. And tell the land managers about it. ■

Birth of a Cooperative • Close to the Ground

Of all the conglomerations of collective living, hard work and youthful idealism that flourished in the 1970s, the Hoedads in Oregon deserve a history, if for no other reason than because they are still in business today. This tree-planting cooperative has also reformed the business ethics of an entire industry, fostered land stewardship by persuading federal bureaucracies to be better managers, and acted as an open-air school and catalyst for dozens of other worker-owned businesses. Not bad for a bunch of hippies.

Including all the personal perspectives of a democratically run business is essential in telling this story, and Hal Hartzell has done an elegant job of weaving many voices, recollections and snapshots into a chronological narrative of the years 1970-1974. Two additional volumes are planned. The result is ***Birth of a Cooperative****, a book about how to create an economic niche without sacrificing ideals, presented with all the personality and great stories of a tour through a good friend's scrapbook.*

Close to the Ground *is written by a former Hoedad named Howard Horowitz. This slim collection of poems provides a strong sense of the unique places Horowitz planted trees, and an equally strong feeling for one of the hardest physical jobs there is.* —*Richard Nilsen*

•

Planters never stop moving, are quick without hurrying.
Hand on tree, back straight, eyes search for the next plantable spot; back bends, hoedag blade falls, tree goes down, eyes watch straight roots go into a deep hole, hand and forearm tamp dirt with blade; back straight, hand on tree, eyes search for the next spot.
Five hundred, seven hundred, a thousand times a day the hoedag rises and falls, the dirt opens and closes around another tree.

•

Most payments to contractors were based on an amount per tree planted; the more trees that were said to have been planted, the more money the contractor made. Some contractors encouraged planters to bury trees or to stash them under logs when the inspector was not around. . . . The agencies, of course, were interested in reporting the highest possible number of trees planted per acre, because their timber cutting quotas were directly tied to the number of trees replanted.

•

When I worked on contractor jobs before Hoedads, there were some people who buried trees to keep their totals up. But there were some people on the crew I worked with who thought we shouldn't bury trees. Those two opposing sides were always represented where I worked. I always took sides with people who thought they shouldn't bury trees. My own feelings were that it was dishonest and it colored the whole relationship the person had with their livelihood. . . .

We were doing two things planting out there; we were earning money, but we were also gaining experience and learning things together. I felt that the relationship and the experience were worth more than the money. I still think it's true. We got some money for the job, but it's all gone. The relationships and what we learned are still with us. —*Joe Earp*

•

Hoedads started summer on Cougar Mountain with a two-day solstice party. Each crew chipped in fifty bucks to cover food, beer, a generator for the music and enough dynamite to blow holes for two latrines.

•

Besides emanations of worker-ownership, another unique aspect of Hoedads was the rising equality in the number of men and women. . . . There were as many thoughts about women working in the woods as there were Hoedads. One thing for sure was that it was difficult for anyone to become a treeplanter, and perhaps it was particularly tough for women. Since virtually no women were working for contractors, at least one myth was overturned by Hoedads; they were 25% women.

—*Birth of a Cooperative*

•

DORENA

The moral act of planting trees
can be a charade:
bundles of 50 stashed in a log,
"stuff and stomp" 1200 a day.
Our crews would never do that
(we hope), but the more subtle tricks

— cut out the corner
if you get away with it,
space a bit wider
than the contract allows —

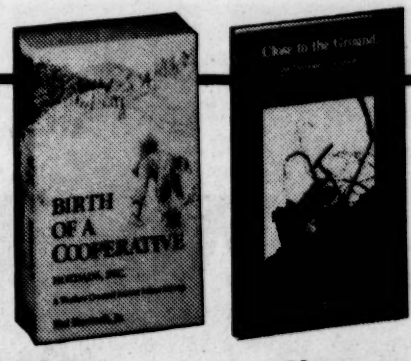
are irresistable,
since the government also plays those games,
and they stack the deck.

After years of talk, the B.L.M.
offers a new kind of contract:
bidders study each site
and develop a plan.
Pay depends on survival,
not daily inspection.

For an hour each morning
we cull trees on the landing.
The crew plants slowly,
choosing spots with care:
the beginning
of stewardship.
—*Close to the Ground*

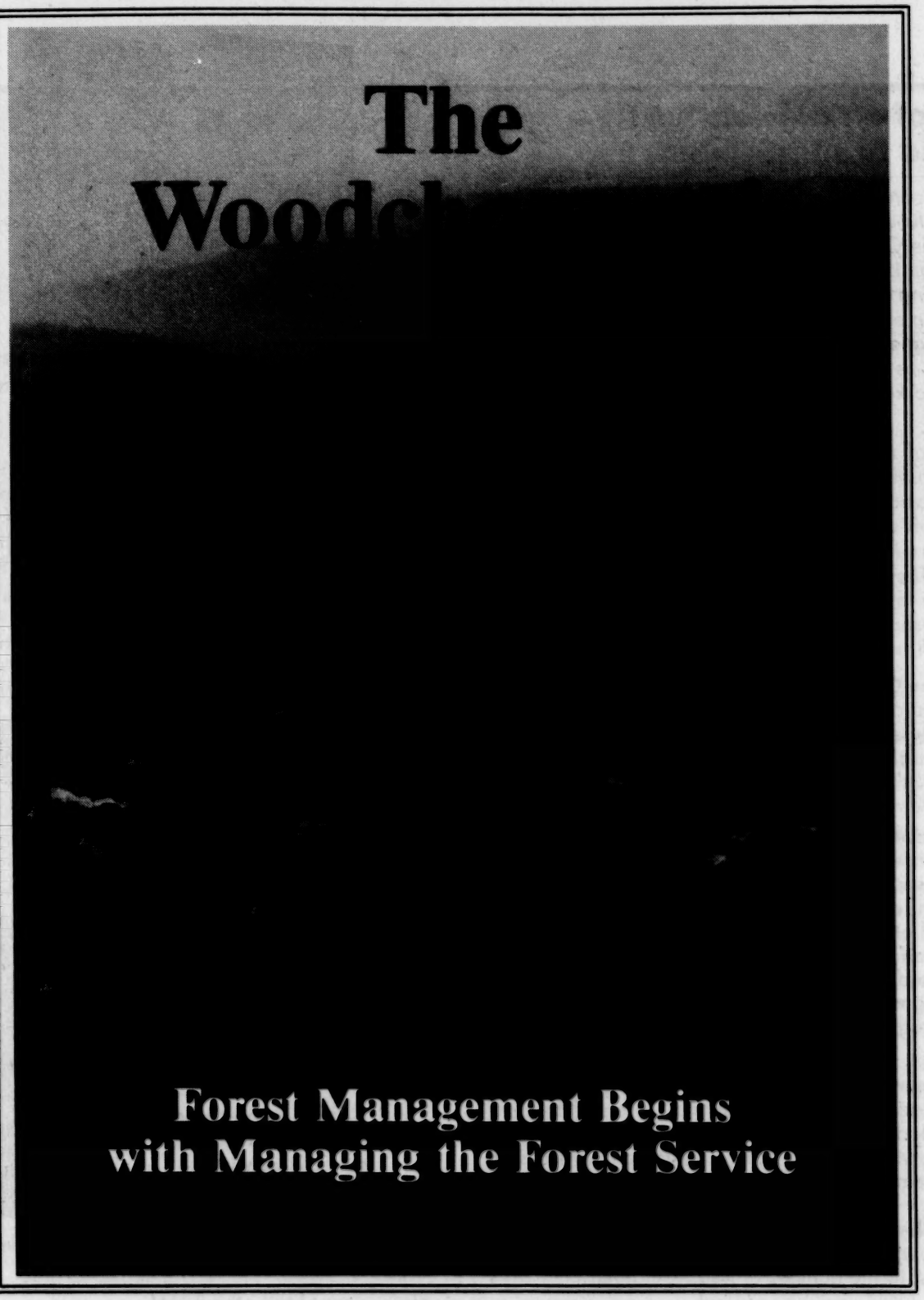
Hoedags.

The Hoedads are hiring. They are a worker-owned coop involved in all phases of forest management. That'd include such jobs as planting, thinning, timber cruising, trail and fence building, cone collecting. The work is tough physically and mentally. Serious inquirers should contact the Hoedads at P. O. Box 10107, Eugene, OR 97440 (503/485-2424).



Birth of a Cooperative
Hal Hartzell, Jr.
1987; 352 pp.
$12.95
($14.50 postpaid) from:
Hulogosi Communications, Incorporated
P. O. Box 1188
Eugene, OR 97440
or Whole Earth Access

Close to the Ground
Howard Horowitz
1986; 40 pp.
$6.95
($8 postpaid) from:
Hulogosi Communications, Incorporated
P. O. Box 1188
Eugene, OR 97440
or Whole Earth Access



Forest Management Begins with Managing the Forest Service

by the Beckwitt Family

WITH THE PASSAGE of the Organic Act of 1897 the United States Congress created the National Forest Service system of reserves in order to protect navigable rivers from sedimentation by maintaining forest cover in their headwaters, and to provide reserves of timber for future generations.

These reserves were created in a time of extensive and devastating forest exploitation. Throughout history, commercial logging has relied on "cut and run" methods; loggers thought no more of regrowing forests than miners thought of putting gold back into the earth. Across the country, forests were gutted by clearcutting; severe slash fires burned in the wake of logging, burning hundreds of thousands of acres, and killing people. In many regions of the country, timber famines arose after whole forests were completely destroyed.

Until the mid-1940s, the reserve status of the public forests remained largely intact. The timber companies were busy logging their own private lands, and the United States Forest Service was busy practicing an early version of modern sustainable forestry, conserving the forests, protecting them from fire and conducting mostly salvage logging sales where usually only single trees — dead, damaged or mature — were removed.

The stumpy vista above is part of the Tahoe National Forest in California. The future of our federal forest lands — who uses them, who abuses them, and how fast it happens — is being argued and decided now. Eric and Willow Beckwitt, along with their father Steve, run the Forest Issues Task Force from their home in Nevada County, California. —*Richard Nilsen*

In the late 1940s the rapid exploitation of the public forests began. The postwar housing boom was in full swing, the privately owned forestlands had been heavily logged over,

and the timber industry turned increasingly to the public's forest reserves.

In the early 1950s, to aid the American timber industry, the Eisenhower administration simultaneously increased the amount of timber the Forest Service must produce annually and retired many of the older, experienced "rangers" who had remained from the days of forest conservation. To meet the increased timber goals with a reduced staff, the Forest Service was forced to return to areas previously lightly logged and clearcut them. Furthermore, the reduced staffing prevented them from closely supervising the loggers in the woods, leading to increasingly destructive environmental impacts.

There was immediate and extensive public concern, resulting in detailed Congressional hearings on clearcutting and forest management in the early 1970s. In the early to mid-1970s, environmental groups in different regions of the country took the Forest Service to court, alleging that under the Organic Act, clearcutting was illegal. Federal court findings and rulings in 1973, 1975, and 1976 confirmed that, in many situations, clearcutting in the National Forests was occuring in violation of the Organic Act; and the Forest Service and timber industry were faced with the prospect of reduction or elimination of clearcut logging in the National Forests.

Due to these court rulings and to mounting public concern, Congress enacted in 1976 the National Forest Management Act (NFMA), which ordered the preparation of the comprehensive land and resource management plans for each National Forest in the country. That process continues even today. During the writing of the NFMA, timber industry lobbyists and Forest Service legislative agents weakened its environmental regulatory powers and as a result the NFMA was a serious blow against sustainable forestry.

The language of the NFMA gives lip service to the concept of sustained yield forestry without providing legislative substance for its implementation. It legalized clearcutting and allowed replanted "even-aged" conifer forests to be clearcut again at an extremely early age, mandating the end of quality wood production in the United States.

The Reagan administration took

The National Forest Management Act of 1976 legalized clearcutting and allowed replanted "even-aged" conifer forests to be clearcut again at an extremely early age, mandating the end of quality wood production in the United States.

power early in this National Forest planning process and in the early 1980s shaped and reshaped Forest Service implementation of the NFMA. The directions issued by the Department of Agriculture to the Forest Service dictated that timber commodity production be dramatically increased during the first five- to fifteen-year planning period.

The forest plans that are currently being released for public comment for the National Forests of the West Coast all reflect the Reagan/timber-industrial view of forest "factory" management. These plans elevate timber commodity production to the forefront of National Forest uses. With an economic basis that stands in stark contradiction to budget-reducing Reaganomics, the federal government's forest plans propose to subsidize the weak timber and building industries by stripping off the last temperate forests of western North America. The Forest Service has ordered that these plans be completed no later than the end of the Reagan Administration in 1988.

The Tahoe National Forest has been the focus of a major education and reform effort by northern California conservationists. It lies in the mountains of the north-central Sierra Nevada in the Yuba, American and Truckee river watersheds. Within the forest boundaries are over a million acres, including 795,000 acres of public land, with the remainder being held largely by private timber corporations.

Under direction of the Tahoe National Forest's current management plan the forest is being rapidly liquidated. In the past decade, large clearcuts have become prominent throughout the western slope, often square in shape. The bare subsoil of these deforested areas is visible for miles. On public land, approximately 2,000 acres are clearcut each year. On the private lands within the Tahoe National Forest, private companies are logging at faster rates than the Forest Service allows, with the intent to clearcut and completely liquidate their timber in the northern Sierra within the next fifteen years.

If implemented, the Draft Land & Resource Management Plan for the Tahoe National Forest would increase clearcutting within the forest boundary to about 4,000 acres a year or nearly 70 square miles a decade. The National Forest Land and Resource Management Plan released by the Forest Service would authorize the clearcutting of over 1,000 square miles of the Sierra Nevada in the next fifty years!

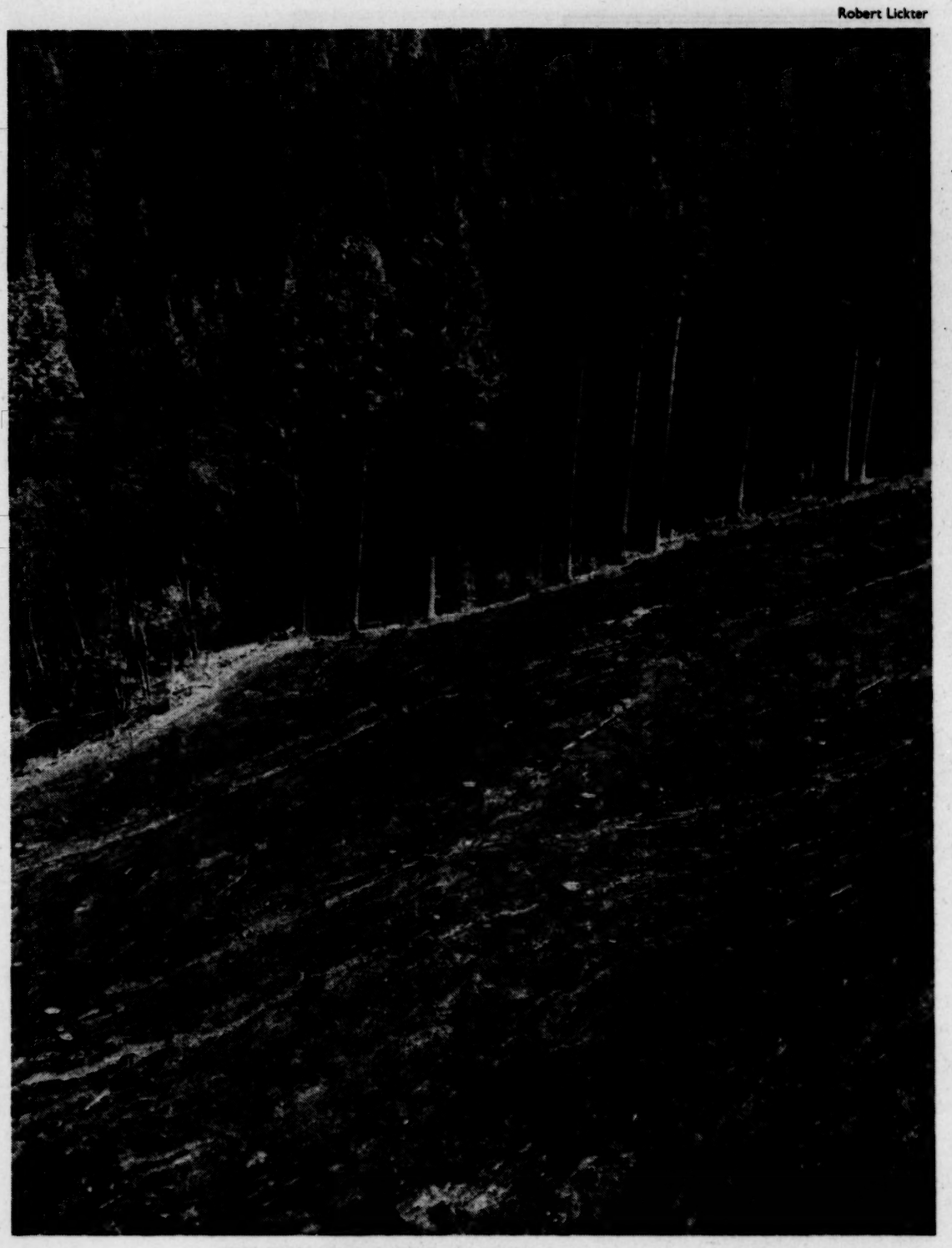
The trees presently being cleared from the Tahoe's natural forests are old. Many germinated before the arrival of western man, and most are nearly 100 years old, having grown in since the heavy logging in the second half of the 1800s.

However, as these older naturally grown forests are removed, they are being burned and replaced with cornfield-like "plantations" of a few species of conifers. These plantations are "weeded" — mechanically or with herbicides — to remove the shrubs and hardwoods that compete for light, water and nutrients with the forest-factories' "crop" trees. The plantations, if they survive the risks of life in monocultures, could grow into high-quality trees over time; but they will not be given the chance.

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to "rigorously explore and objectively evaluate all reasonable alternatives" during the formulation of their management plans. The draft versions of the Forest Service's management plans violate this law by failing to explore and evaluate any cutting methods but clearcutting.

Citizen groups across the country have prepared alternative land management plans based on sustainable forestry methods for their nearby public forests. The Citizens' Alternative for the Tahoe National Forest suggests numerous changes in forest management, including the abandonment of many highly destructive activities. The goal of this alternative is to integrate the local society into the forests of this region

Robert Lickter



Clearcutting causes soil erosion. No soil, no trees. This clearcut hillside in California's Tahoe National Forest is undergoing the same process that stripped Greece of its forests and changed it into a country of rocks and goats.

and to foster a long-term symbiotic relationship that provides a sustained yield of high-quality forest products — lumber, firewood, recreation, clean water, wilderness and employment opportunities. The Citizens' Alternative would manage parts of the forest for human needs without causing the extinction of other species, impoverishment of the soil, or loss of genetic diversity.

Sustainable forestry techniques are based on the perception of the forest as living organism, not an industrial factory. The combination of careful selective single-tree logging, the creation of small openings, the reliance on natural seeding, and the artificial restoration of locally extirpated tree, shrub, and herb species will restore and maintain each native species in its optimum ecological distribution.

Trees are cut and removed from the forest individually or in small groups. "Group selection" openings in the forest canopy, much like small clearcuts of less than 1.5 acres, are made just large enough to meet the sunlight requirements of the native conifer species for seedling establishment and growth. Group selection cuts are located in small aggregations of larger trees; young, rapidly growing trees are thinned, not clearcut. Thinned trees are lopped or chipped and left on site to maintain soil fertility.

Trees of all species and sizes are removed at each cutting entry into the forest. Large trees, snags, dead and down material, seed-bearing hardwoods, and patches of each forest successional stage will be maintained on an acre-by-acre or otherwise local basis. Through natural seeding, site-adapted genetic strains are maintained on-site.

Trees are felled towards the center of the opening, avoiding damage to the surrounding forest. There are no logistic or economic differences between large-block clearcutting and small-group selection. In openings larger than 1.5 acres, trees must be dragged or winched to more than one spot for loading anyway, and the operator can just as easily move one-half mile or more to a new group selection and set up again.

Quality lumber production is emphasized over short-term pulpwood production; merchantable trees are allowed to grow into high-quality wood everywhere in the forest. High-quality wood comes from older, large, slow-growing trees. Young trees grow rapidly, laying down short fibers. After about seventy years, growth slows and seed production begins in earnest; the adolescent tree begins to lay down long, strong fibers.

The amount of wood that can be removed annually from each site is based on that site's ability to grow trees, not average statistics from "somewhere in the Sierra Nevada." Actual growth is measured using a permanent plot system. Annual cut never exceeds annual growth.

We are at a modern historic cusp in the destruction of the soil productivity of the forests of western North America. If current timber clearcutting, road-building and erosion levels continue for two to three human generations, our forests will resemble those of the Mediterranean. They will likely be gone for millenia.

The current practice of slash (tree tops and branches) burning is ecologically costly because of soil productivity losses. Soil organic material content is reduced by litter burning and the interruption of litter decay cycles. Reduction of soil

water storage capacity effectively shortens the forest growing season. It is economically costly, especially on steep slopes, because the surrounding forest must be protected from fire; crews of Forest Service people, trucks and equipment must be on site.

Very little data exist on the costs of chipping and lopping, but in a recent local timber sale some of the trees were scheduled to be cut near a residential area, and the logging contract specified that the residue be chipped. The cost: $18 per acre. Burning in place, in the same timber sale, cost over $200 per acre.

Slash burning is practiced in spite of its high costs because of Forest Service institutional inertia — the practice increases the agency's budget and staffing levels.

In the Citizens' Alternative, soil productivity is protected by maintaining a thick organic mulch on the forest soil at all times. Logging debris is chipped or lopped and respread, maintaining the litter layer and its mineral cycles intact.

Depending on the erosiveness of each soil type, logging will not occur on slopes over 30 to 40 percent (approximately 15-20 degrees). Marginally productive soils, where most site nutrients are contained in the living vegetation, will not be logged. Steep slopes and less productive areas are retained in forest for watershed and climate amelioration, natural forest habitat, recreation, and erosion control.

In the quest for the perfect and fully productive "factory" forest, herbicides are used in an attempt to kill native shrubs and trees that grow in the clearcuts planted with young conifers. Two or three herbicide applications are often necessary to successfully control the competing vegetation. Herbicide exposures have been repeatedly linked to cancer, birth defects, brain damage and severe allergies in animal laboratory tests and humans.

In the Citizens' Alternative, use of herbicides is replaced by "manual release" — local people working in the forest with hand and power tools, cutting the shrubs that compete with young trees in the group selection openings. Where possible, early succession species, both shrubs and herbs, will be left for the mule deer and other species that require them. Manual release creates healthy local forests and economies; herbicide use creates toxic environments.

Smokey and his friends are daily being devastated not by fiery infernos; they are being systematically exterminated by a holocaust of destructive clearcut logging unparalleled in American history.

The Tahoe National Forest contains over 160,000 acres of inventoried roadless area; recognized, but unprotected, wilderness. Mostly situated at high elevations and on extremely steep slopes, the roadless areas are some of the last intact examples of natural California. While many of the roadless areas in the forest have never been subject to logging, the Forest Service plans to construct roads and extensively log in six of the nine remaining inventoried roadless areas within the next five years. Due to the magnitude of the destruction presently associated with logging and road construction (immense road and "landing" cuts into steep slopes), the wildland qualities of these areas would be lost, possibly for thousands of years.

Under the Citizens' Alternative, both inventoried and noninventoried roadless areas are protected as gene resource conservation areas; islands of undisturbed forest habitat for native organisms that require large home ranges and/or minimum human interference; control forests to compare managed forest against; wildland recreation areas for people seeking peace; and areas where the continued evolution of natural communities and ecosystems can occur.

The goals of the Citizens' Alternative are achievable, but will require the education of the Forest Service and the wood-products industry regarding sustainable forest management techniques. The American public will have to accept the increased costs of managing forests for long-term stable productivity; we must abandon the dispose-all use-it-up attitude toward wood products.

The increased costs of wood products can be partially offset by the institution of widespread paper product recycling and the resulting decrease in demand for wood pulp. In a wood-framed structure, the lumber cost is a small fraction of the total construction cost; thus, housing construction costs are only minimally increased by lumber price increases.

The Forest Service has strayed widely from its noble conservation tradition. Smokey and his friends are daily being devastated not by fiery infernos; they are being systematically exterminated by a holocaust of destructive clearcut logging unparalleled in American history. Ultimately the American people must change the policies and laws guiding the Forest Service by urging Congress to mandate, legislatively, a major change in the attitudes and behavior of the managers of the public's forest reserves. Therein lies the hope — the knowledge of the dangers of deforestation must spread door-to-door by mouth and the written word. Then that public sentiment must be communicated by ballot and letters to the halls of Congress.

Concerned citizens can have a major impact on the outcome of the current National Forest planning process. Pick one or two National Forests close to your home or heart. Get involved in the forest planning activities as an exercise in learning the details about the forest and its fate. Even if the plan is completed, you can keep the environmental monitoring provisions well enforced. Timber sales involving destructive and illegal practices can be legally challenged.

The following regional and national organizations are actively involved in protecting our National Forest lands.

Forest Issues Task Force
Sierra Nevada Group, Sierra Club
P. O. Box 29
North San Juan, CA 95960
Send name and address to receive action alerts. Membership $29/year.

Forest Watch
CHEC, P. O. Box 3479
Eugene, OR 97403
The Citizens' Forestry Magazine. Subscription $20/year.

The Wilderness Society
1400 Eye Street NW
Washington, DC 20005
Numerous forest planning publications. Membership $30/year (individual); $35/year (family); $15/year (students/senior citizens). ■

BACKSCATTER: echoes from readers back to *Whole Earth Review* (27 Gate Five Road, Sausalito, California 94965)

Royal Dutch Brand

According to what you've written (*WER* #53, p. 88) Stewart Brand has been working for Royal Dutch Shell which has been especially targeted for boycott because of their extensive South African support.

When many groups adopt a global strategy of boycotting South Africa, some anti-apartheid folks might feel more personally effective by not following that boycott. Personally, I feel following the current global boycott is effective. Until there is a better strategy, disciplined support for the current plan is important.

Perhaps Mr. Brand has another point of view? Perhaps he feels a combination of strategies is more effective?

Are you endorsing and participating in the boycott of Royal Dutch Shell?

David Oaks
Eugene, Oregon

Am I endorsing and participating in the boycott of Royal Dutch Shell? The answer comes out of answering three other questions. 1) Am I most concerned with the morality of intention or the morality of outcome of an action? 2) Has any nation ever changed its behavior dramatically as a result of being isolated? 3) What are the specifics, the awkward details, of the matter?

Some corporations, I judge, are probably better out of South Africa. Some, either because of good social programs or effective opposition to apartheid, should stay and fight where they can have the most effect. I think Shell is one of those, based on fragmentary knowledge. (I haven't been to South Africa, but I'll take any opportunity to go, following up on the life-bending poignancy of my three months in Kenya year before last.)

I don't support economic/cultural boycott and embargo of Nicaragua, Cuba, the Soviet Union, or South Africa, for a uniform reason. I think isolation freezes; embrace thaws. Example: Paul Simon's "politically incorrect" album of South African music and musicians, "Graceland," is a musical and cultural triumph of thaw-by-connection.

Apartheid means separation, and feeds on it.

Stewart Brand

Who you callin' stupid?

I would like to take Carlo M. Cipolla's essay on "The Basic Laws of Human Stupidity" somewhat seriously since it seems to fit experience so well. However, while claiming to be describing the results of extensive field work, he nowhere reveals his sorting criteria for deciding who is stupid and who is nonstupid. If it is some sort of test (more than a Rule of Thumb), then it must be applicable to the general masses and to the relatively less accessible population of Nobel laureates (as the author suggests that he has applied it). Otherwise, the Basic Laws themselves are useless and we can never know who dwells in the σ fraction and who in the $1-\sigma$.

Suppose that I wanted to put together an office staff and am willing to make the effort at the outset to minimize its content of stupid people. How would I go about it? Or is this destined inevitably also to be a subpopulation with its own ratio despite its composition by advance selection? If so, then the fundamental frequency distribution is a ratio as immutable as the speed of light for all observers and whether a given individual is stupid or nonstupid is only relative to the situation and not a constant quality of that person.

Avery R. Johnson, Ph.D.
Milford, New Hampshire

AmerRuss

That's not a Russian "R"!

Let's start U.S.-Soviet understanding by correcting the popular misperception about the "backwards R". It's not an "R" at all, but a letter, pronounced "ya." For example, it's the last letter in the Russian spelling of Kat*ya*; the first in *Y*alta.

The actual Russian "R" looks like our "P". You see it in the Cyrillic "CCCP," which is our "SSSR," their name for their country: Savez (Union) of Soviet Socialist Republics.

Let's get informed, and at the same time avoid any unconscious associations of "backwardness" with the Russian alphabet.

Lynn Nadeau
San Francisco, California

AmerRuss/ByzRomantine

To truly understand the relationship between America and Russia and its fuller implications, we need to look beyond to the deeper historical as well as "archetypal" roots connecting these two nations. It could be argued, for example, that in the cultures of America and Russia we see the two primary descendants of the ancient Roman empire; for while the forms of the empire have long since vanished, the imperialistic spirit of Rome lives on in these two superpowers. But the analogy may be drawn even finer. Beginning in the year 293 A.D. the Roman Empire began dividing into two sections, one centered in the east (Byzantium), the other centered in the west (Rome). In its architecture (the Kremlin is a case in point) and its alphabet (Cyrillic), the modern Russian nation can be see as the inheritor of the eastern, Byzantine culture;* and in its architecture (the capitol building, as but one example, is based largely on the Roman pantheon), alphabet (Roman/Latin), and political terminology (Senate, Republican, etc.); the United States can be seen as the primary inheritor (via England) of the western, Roman empire. Seen on this level, the tensions between these two superpowers may be understood as the working out of a schism that extends back almost two millenia.

But what, more precisely, *is* "Rome"? To psychologists like Carl Jung and James Hillman, the Roman empire was not so much a political entity as the concrete embodiment of a *way of being;* in its monumental architecture and imperialistic policies Rome reflected a new sense of identity, a new level of ego-awareness in the consciousness of mankind (a development that coincided, incidently, with the culmination of the equinoctial age of Aries — the sign traditionally associated with the awakening of self-awareness and ego consciousness).

In the nuclear dance of these two superpowers we are unfolding a myth of the warring brothers, of Romulus and Remus (Cain and Abel). Our connection as nations, therefore, is far deeper than we have generally suspected. We are as the split-off halves from a single original whole, sensing in each other that missing aspect of our own nature.

The important point to remember is that wars, however large, do not happen apart from the individuals fighting

them; this large-scale egoic drama is taking place not somewhere outside of us but *within* each of us. The stand-off between Russia and America is in fact but the reflection of a stand-off taking place in the psyches of all humans at this stage of our development.

Sharing of the bloodline from both parents, from the communist-oriented Russian culture on the one hand and the more democratically oriented American culture on the other, perhaps this will be a new sense of identity posited somewhere between these two philosophies, between the notions of the group and the individual. Whatever the outcome, it is obvious that we can no longer attempt to understand the dynamics of this confrontation strictly in terms of conventional historical analysis, but must also be able to see the inner, psychological significance as well. To fail to do so may be to miss the true importance of the most far-reaching historical development of our age.

Ray Grasse
Naperville, Illinois

* It is also worth noting that the word "Czar" derives from the word "Caesar."

AmerRuss redux

WER #53's "AmerRuss" presents Robert Fuller's proposition of combining the two superpowers. Unfortunately, it is not an original idea. I cite Jacques Bergier's "La Grande Conspiration Russo-Americaine" (Paris: Editions Albin Michel, 1978) which details in 227 pages not only why this may well come about but what steps are being taken (perish the thought!) to hasten the day. Bergier, who died a few years ago, was a scientist and intelligence specialist who wrote 25 books, many of them co-authored with people such as Louis Pauwels, and who edited an encyclopedia of science and technology and an anthology of science fiction. He was a brilliant man and appeared on quiz programs as a kind of living computer, who knew all the answers.

Michele Burdet
Villars/Ollon, Switzerland

Devolving AmerRuss

Robert Fuller's article on joining together the Soviet Union and the United States into a single state "AmerRuss," *WER* #53, p. 30) raises some interesting questions about the nature of political power. . . . Fuller chiefly provides "peace" as a motive for this political merger. Peace is a wonderful goal, but history cautions us to look carefully at what it costs to buy it. My own inclination is that the scale of centralization necessary to bring about Fuller's vision would have disastrous results. This is due to the fact that while the USSR and USA have a great deal in common as states, they have little in common as nations. . . . Nations are linguistic, cultural and racial continuities: the French, the Basques, and the Inupiat are nations. The USSR and USA, however, are polynational states; they contain many nations, but are not nations themselves.

The problem with the structure of modern states is that they tend to suit the purposes of their dominant nation but no other. The rights and sovereignty of Native Americans, for example, have been consistently subverted to the will of the dominant European culture in the USA.

States tend to propagate the "tyranny of the majority," and the more minority nations that are geographically encumbered by the state, the more expansive the tyranny. Leopold Kohr set forth theory that backs this up in *The Breakdown of Nations*, concluding that social misery is a proportional result of the mass of a state: the bigger the state, the more misery it inflicted on its own people and the people of other states. He argued that fear of retribution alone kept human behavior in check, and that bigger states had less fear of punishment so they perpetrated more heinous crimes. The current "balance of power" between the USSR and USA presumably stops both from any massive evil. Joining the two together would lead to misery without historical precedent because it would remove the threat of retribution. Kohr demonstrates that it is during periods of decentralized power that humanity flourishes, and advocates "disunionation" (devolution) as the only serious remedy for social ill. Although Kohr is often naive, he is not optimistic about the prospects for disunionization: he envisions a single global state of frightening power and malevolence. *That's AmerRuss.* The world would be at peace in such a circumstance, but would it be a desirable peace?

Should peace-for-peace's-sake be our singular objective? Self-rule, the ability of a nation to maintain sovereignty over itself, may not bring an end to war, but it does minimize the persecution and subjugation. AmerRuss, on the other hand, represents a step in the wrong direction. The smaller nations of the world may be married to peace under AmerRuss, but it would be a shotgun wedding. Devolution may lead to an overall reduction in peace as it is narrowly defined, but it would be preferable to AmerRuss in terms of social justice.

We ought not be lumping states together into bigger states; we ought to be dispersing power — breaking the modern states down into smaller units, true nation-states that realize the principle of self-rule. Who understands a nation better than the nation itself? There may be friction between nations under such a system, but the overall social good it would create would overwhelm the schizophrenic, mutated peace of AmerRuss.

Scott R. Olson
New Britain, Connecticut

Earth First! fascists?

Another denunciation of Earth First! (Stephen Rhoads in "Backscatter," *WER* #54, p. 138). Rhoads says that Earth First!ers are "shoddy thinkers" who show "a tendency to turn into fascists." In fact, it is Rhoads who does the shoddy thinking; and what's really scary is his own unwitting (we may hope) support of the crypto-fascism in which we are all immersed and which is the root cause of our continuing environmental crisis.

Rhoads thinks that Earth First!'s vision of a re-created or restored "natural order," with lots of wilderness and substantial deconstruction of inappropriate technology, is "inconsistent" because it fails "to understand the niche that we humans occupy in the ecosystem that spawned us." This is crazy-making nonsense of the craziest kind. It is precisely because the EF! vision *does* understand the niche we humans have so far made (as bloated, destructive, and self-destructive, etc.) that the EF! vision does not accept that niche, and seeks to revolutionize the character of our human niche into something that is practically and ethically more viable. The sense in which the niche (if it really is one) that we have so far created is "natural" is the sense of the term that makes whatever we do natural. This leaves us, as always, with the question what we should do — hence the need for vision.

Now one may certainly disagree with the exact shape and content of the EF! vision, which only underscores our responsibility to help find the best vision we can. But to project onto EF! (as Rhoads does) the confusion and "will to power" of the status quo (that is, our niche as presently shaped) is nothing more than the usual sort of apologetics for the crypto-fascism of the status quo. We must all, including Rhoads, break through the clouds of self-deception that cause us to project our own irrationality and "emotionalism" (our desirefulness) onto those few radicals who do have some real vision, and

who have the vision to try to realize some of it.

Tom Birch
Madison, Wisconsin

Dead wrong

I'm very upset about some of the books you advertise. As an animal rights' advocate and a vegetarian, I find it intolerable that you advertise books on butchering. Please refund the price of my subscription at once.

Gloria Bittman
Berkeley, California

Felicitous fungus

Lawrence Lile (*WER* #54, p. 140) describes the use of jewelweed juice as a poison-ivy remedy. I think I know why it works and why it's best not to use an alcoholic extract as he suggests. And I can suggest some mushrooms whose juices will also neutralize the active principle of poison ivy, which is called urushiol, and is also found in poison oak, poison sumac, and the Japanese lacquer tree. In fact it gets its name from "urushi," the Japanese word for lacquer.

An enzyme called laccase, or p-diphenol oxidase, extracted from a shelf mushroom named *Polyporus versicolor* (alias *P. trametes*) has been used to harden the lacquer, which it does by oxidizing the urushiol to another compound (a quinone), which spontaneously polymerizes. This process renders the urushiol innocuous. This is only part of what I learned at the library. The most interesting thing I found was a reference to U.S. Patent 4,259,318 which described an invention of Nanda V. Duhe and Donald L. Hendrix. It was a cream to be applied to the skin for the relief of poison ivy, and its active ingredient was laccase.

I was struck by a brilliant idea. A poison ivy lesion on my wrist was itching badly, so I tore a piece of the cap off a Boletus badius mushroom and rubbed it on the lesion. It was rather messy, but in a few minutes, the itching stopped, and it never returned!

Oh yes, jewelweed. I guess it contains a similar enzyme. And since enzymes may be denatured by alcohol, I guess an aqueous extract would be more stable than Lawrence Lile's alcoholic extract.

Marshall E. Deutsch
Sudbury, Massachusetts

Symbol of success

Recently a friend wished me, for the New Year, 1) health 2) happiness 3) peace 4) love and 5) success.

What surprised and saddened me was that while we have ready-made symbols for happiness, love and peace, we have none to show success — beyond the dollar sign — and none for health — beyond the snake-entwined medical emblem which connotes sickness more than it does health.

I am wondering if you would like to invite entries to create two symbols — for health, and success.

Judy Stewart
Kendall Park, New Jersey

Desktop sloppy publishing

I was disappointed to find in both of Jay Kinney's review articles (pp. 70-71 and p. 81), as well as Michael Green's testimonial (pp. 73-80) in *WER* #53, an enthusiastic portrayal of the Macintosh computer/LaserWriter printer under the rubric of "desktop publishing." I believe that what we have here is an example of media hype overwhelming the very folks many of us rely on to defend us from media hype.

Jay claims "the LaserWriter will pump out near-typesetting quality text. . . ." The question, for anyone who wants to do serious typesetting while cutting out the costly trip to the professional typesetter, is how near typeset quality is "near typeset quality"? The first issue of Jay's own *Gnosis* magazine was done with conventional typesetting, and with some Mac/Laser printouts. Jay now rents time on a more sophisticated (read fabulously expensive!) laser printer, the Allied Linotronic 100. The samples done on a LaserWriter in *WER* were interesting and often elegant, but lacked the clarity of typeset print.

As Jay later states, the (Laser/Mac) "tools for desktop publishing seem best suited to modest tasks such as sprucing up an 8-page newsletter that was previously typewritten, or knocking out an ad sheet or flyer in a day's time." I quite agree. If you're producing the kind of print you expect people to read once or twice and then throw away, the lively but sloppy laser effect may be just fine. But if you're making a statement you hope people will value and return to again and again, it should be visually clean.

Avoiding paste-up is the best reason for going the Mac/Laser route. For the mostly one-man publication (I've been there too, Jay!) it would be great to be able to produce a designy effect without all the wax and knives and tape . . . but if embracing the Mac/Laser route means settling for grainy graphics (which have none of the sharpness or spontaneity of Zen) and shoddy typesetting . . . is it worth all the hoopla and expense?

Ya'qub ibn Yusuf
Winnipeg, Manitoba

Burning eyes

The back cover of *WER* #54 is lovely and interesting from an artistic standpoint, but I am concerned about the depiction of the "eye of James" as open. The artist may actually have colored it in over the image of a closed eye, however people may not realize that keeping your eye open on the plate of a copier during the process of copying may do damage to the eye. It may actually burn the retina.

Karin X. Friedtel
Calistoga, California

Early CoEvolutions

We have two sets of brand new *CoEvolution Quarterlies*, #1-13, for sale for $100 each set. Write Dick Fugett, Far-Ranging Factotum, at *WER*.

Update

- Good news! The excellent *Plants of the Gods* (*EWEC* p. 220) is back in print.
- There was a paragraph about *High Frontiers Magazine* in *WER* #52 (p. 84) with an invalid address. The correct one is P. O. Box 40271, Berkeley, CA 94704.

Experts wanted

You readers know more about the subjects we cover than we do. When we publish startling, groundbreaking news, or the ultimate survey of a dense field, it is almost always written by an enthusiastic reader. Someone like yourself. There is some subject you already know intimately that would interest the rest of us. Why don't you tell us? Keep it simple and friendly.

We are particularly keen to find experts who can point us to the latest in a growing list of topics, such as glassmaking, swimming, pets, infertility, small-time real estate, scientific/educational tours, language, musical instrument making, and good toys.

The right expert will let us know what the current best in books, periodicals, video tapes, and mail-order sources are. As always, we pay for everything we use, including suggestions (if you are the first). Surprise us. —*Kevin Kelly*

Corrections

Several errors in the last issue need correction. The article "Pot Moves Inside" (p. 62) was not written by Ed Rosenthal as stated but by Jorge Cervantes. Ed Rosenthal took the photographs (not credited) accompanying the story. We inadvertently omitted the credit line "suggested by Faith Florer" for the book *Advertising Pure and Simple* (p. 83). Denis Morella, who illustrated "How to Stay in Right Relationship with Everything from Chocolate to Cocaine" (p. 60), also went creditless. The review of the People's Medical Journal (p. 72) got royally screwed up. We listed the correct access information, the correct cover and the right excerpts, but everything else is wrong. The People's Medical Journal is not put out by the People's Medical Society as the page erroneously indicates. The review by Tom Ferguson speaks about the People's Medical Society, not the Journal. The review that should have appeared with the Journal is as follows:

The People's Medical Journal

I became addicted to listening to Dr. Dean Edell on AM radio in California four years ago. He is an avid reader of traditional Western medical literature and opens each call-in program with a summary, in layman's terms, of all that is new and of interest to the general populace before adroitly fielding questions about anything that could possibly be wrong with a person. I have been impressed by his sense of humor, honesty, openness to non-Western medicine, and willingness to speak out against medical practices that are problematic in one way or another (circumcision, for example).

His program on radio (and TV) is available in cities across the country though not here in Baltimore.

I now make do with his monthly ***People's Medical Journal****, which contains an editorial and reviews of journal articles that are of popular interest. Compared to the Harvard Med School Newsletter, say, these reviews are more numerous (34 in the issue I'm looking at), written with a sense of humor and some editorial comment.*

—*Judy Bond*

The People's Medical Journal

$24/year
(12 issues) from:
The People's Medical Journal
P. O. Box 81
Kentfield, CA 94914

Informants wanted

As the editor of *Maledicta* (*EWEC* p. 299), I am conducting a worldwide survey of contemporary vocabulary of sex, excretions, and offensive exclamations for my uncensored *Dictionary of Regional Anatomical Terms*. Anyone interested in participating will receive a copy of the 24-page *Maledicta Onomastic Questionnaire* containing some 250 questions about regional, humorous, euphemistic, and taboo terms for sexual body parts and activities, excretions, types of people, as well as terms of abuse, exclamations of anger, disgust, etc.

Informants are needed from every region of North America and especially from all other areas worldwide where English is spoken. As this survey will eventually cover all languages, we also need informants for all other languages.

To obtain a copy of the Questionnaire, please write to me: Dr. R. Aman, 331 South Greenfield Ave., Waukesha, Wisconsin 53186, USA.

4. MISCELLANY

M-01 **indoor toilet** (A,Y).
M-02 **outdoor toilet** (rural) (A,Y). Indicate special kinds, e.g. one with two openings.
M-03 **toilet paper**.
M-04 **sanitary napkin**.
M-05 **tampon**.
M-06 **syphilis**.
M-07 **gonorrhea**.
M-08 **venereal disease** (general and others). Explain kinds.
M-09 **insects in the pubic hair**. Explain kinds.
M-10 **spots on bedsheet** (from ejaculate).
M-11 **moist area on bedsheet** (after intercourse).
M-12 **brothel, bordello**.
M-13 **condom**.
M-14 **diaphragm**.
M-15 **spermicidal foam**.
M-16 **(to take) the pill**.
M-17 **other pregnancy-prevention means**. Explain method.
M-18 **menopause**.
M-19 **vaginal spray** (deodorant).
M-20 **merkin, woman's pubic wig**.
M-21 **dildo**.
M-22 **vibrator**.
M-23 **artificial vagina** (used by some men).
M-24 **woman's brassière** (A,Y).
M-25 **woman's short underpants**.

3. EXCRETIONS
(Use nouns and phrases)

E-01 **smegma on the penis** (cheesy matter under foreskin).
E-02 **smegma around the clitoris and labia minora**.
E-03 **pre-ejaculatory liquid excreted from penis during state of arousal** (colorless, odorless drops; from Littré's and Cowper's glands).
E-04 **ejaculate** (liquid, semen). Use nouns. Explain if the words refer to fresh, old, dry kinds.
E-05 **vaginal excretion caused by sexual arousal**.
E-06 **menstrual blood** (A,Y).
E-07 **urine** (A,Y). Use nouns.
E-08 **feces** (A,Y). Use nouns. Explain special kinds, sizes, shapes, etc.
E-09 **(to have) diarrhea** (A,Y). Use nouns and phrases. Explain special kinds.
E-10 **dried feces clinging to hair on buttocks**.
E-11 **gas from the bowels** (A,Y). Use nouns and noun phrases. Explain words that refer to loud, silent, smelly, and other kinds.

Gossip

Kevin Kelly's seventeen-year-old Amish-style beard turned out to be socially unacceptable in Taiwan, where he and his new wife Gia-Miin went honeymooning. (In the Orient, beards are appropriate only for elders.) Kevin was back working on the upcoming ***SIGNAL 1.0*** *book/special issue for two weeks before anyone recognized him. It's still not too late for readers to send stuff for this project, by the way. Suggestions welcome; subject matter just about anything that can be considered part of communication.*

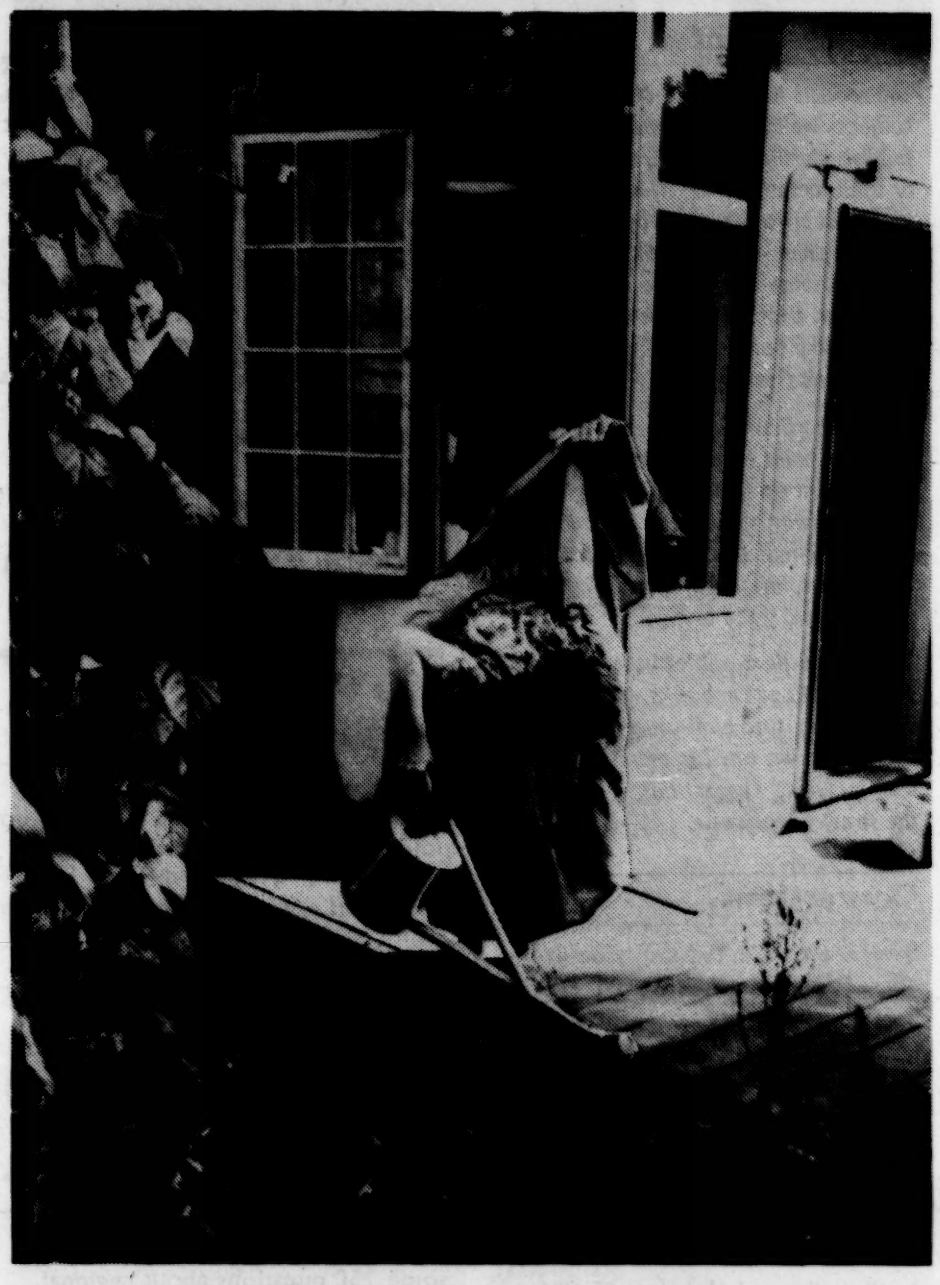
Our onetime editor Art Kleiner is living back in New York City, happily teaching courses in NYU's Interactive Telecommunications Program. Art's getting married too, to a lady named Faith Florer.

It's concrete-pouring time for Susan and Don Ryan; after seven months of sometimes-Byzantine bureaucratic hassle, the building permit has come at last. They've designed the modest 837-square-foot house themselves, and will build much of it too. The design features clever utilization of space (as it must) and has a simple style that will blend nicely with the existing architecture in their rural location 50 miles north of San Francisco.

Also a-building are Dick and Cindy Fugett, who recently held a bedroom-raising (which included a bit of wall- and roof-razing) — adding a new room that will be needed by Bastille Day (July 14), when Cindy is expected to deliver the room's occupant. In addition to her ***WER*** *bookkeeping duties, Cindy is going to school, aiming to be a genuine CPA.*

Liz and I will move into an ageing ranch house this summer as part of a deal that includes fixing the place up in lieu of rent, and land stewardship of the south forty of a 3,000-acre nature preserve. It's quite a change for us — we've lived in our 17-foot Airstream trailer, The Silver Turd, for six years (I've lived in it thirteen years) at seven locations. Settling down at last? Don't bet on it; we're not selling the Turd.

*Antler, a poet of increasing renown, has won the Witter Bynner Prize for Poetry from the American Academy and Institute of Arts and Letters — a considerable honor. We were the first to publish portions of his poem "Factory" way back in '79 (***CQ** *#24). Antler's latest work can be appreciated in his book* ***Last Words*** *($5.95 postpaid from Ballantine Books/Random House, 400 Hahn Road, Westminster, MD 21157).*



Kevin Kelly

Our designer Kathleen O'Neill gracefully tends the scenery outside her office window. Some of it is edible; all of it is pretty.

In a million-dollar, 24-hour telethon to raise money for the twice-arsoned Los Angeles Central Library, various celebrities read aloud from their favorite books. Among them, Red Buttons read from ***Joy of Cooking***, *Charlton Heston read from* ***Moby Dick***, *and Ernest Borgnine read from* ***The Whole Earth Catalog***, *according to the* ***L. A. Times***. *They didn't say which pages he chose.*

Stewart Brand is breathing a bit easier since he finished his book ***The Media Lab: Inventing the Future at MIT***. *It'll be out this September (Viking). Interesting stuff — I read it in one long sitting. Review later.*

There are two new names on the WELL crew: Elaine (Booter) Richards and her husband Andy Beals. He takes the place of Hugh Daniel as Technical Consultant, and she is Systems Administrator while simultaneously going to school to learn how to be a systems administrator. (Elaine's art degree didn't prove very useful.)

One of the most useful items on the WELL is a volunteer group called ENERT (Emergency NErd Response Team). This crew specializes in helping nonprofit organizations set up and debug the computers they've begged, borrowed or otherwise acquired. They are now coordinated by San Francisco computer consultant Daniel Ben-Horin, who brought in a Skaggs Foundation grant. He knows what the problems are from a stint as administrator of a nonprofit. ENERT has already been a great success. Next steps include a phone-in help line and an installation program for nonprofits without in-house expertise.

It's just a rumor, but from a reliable source, you may be sure, that our subscription price is about to rise two dollars. Those in the know might find advantage in renewing now at the old rate.

*Our next issues will be guest-edited by one of our favorite contributors, Sallie Tisdale. She'll come down from Portland, Oregon, where she "writes for life, nurses for money" and shares a household with her three kids (two of them adopted Guatemalans) and husband Bob Macer. Sallie has two books in print — **Sorcerer's Apprentice: Tales from the Modern Hospital** (McGraw-Hill) and **Harvest Moon: Portrait of a Nursing Home** (Holt) — and a new one coming up concerning salt: **Lot's Wife**. Here's the nice clean desk, Sallie. Walk right in and set right down.*

—J. Baldwin

Creative Philanthropist Sought for Membership on the Point Board

The business of Whole Earth has been striving to pull itself up by its bootstraps, but they're too short to get ahold of. There isn't cash to do the kinds of mailings and other promotion it takes to build the subscriber list. Whole Earth has been a nonprofit foundation since the beginning in 1968, but we've always operated on business income. When we had major cash surpluses, we gave them away (over $1 million in grants). We never had an organized philanthropic outreach the way other do-good, low-advertising magazines do.

Ideas on how to do such things well usually come with a human wrapped around them. That's who we need, someone with experience and wisdom on the donor end of creative philanthropy. Would that be you, or someone you know and would encourage to get in touch?

Write me at Whole Earth, 27B Gate Five Road, Sausalito, CA 94965.

—Stewart Brand
(for the Point Board)

Preserves

Join the **Whole Earth Preservation Society and Volleyball Reserves.** Your $25 donation helps support the magazine; in return, you receive four issues of a quarterly newsletter filled with gossip, news, letters and other information. We'll print your name in the magazine (unless you prefer otherwise). Send your check to Whole Earth Review, 27 Gate Five Road, Sausalito, CA 94965. (The newsletter is mailed between magazine issues to all Retainers, Sustainers, and Maniacal subscribers as well as to the following readers, who have recently joined the Preservation Society. Thanks for your support.

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New Plymouth, New Zealand
Permaculture Pyrenees,
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Bill Weiss, Quincy, WA
and one anonymous benefactor

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Moving? The post office often will not forward magazines. Send us your mailing label and your new address six weeks before you move so we can deliver your magazine, on time, to the right place.

Back Issues/ Further Issues

The quickest way to order back issues of this magazine is not from us but from Whole Earth Access (see address at right). ***CoEvolution Quarterly*** issues 14-43 are $3.50 each, postage paid, or $10 for four. Each ***WER*** back issue is $3 for issues 44-47 and $4.50 for 48 on, postage paid. All 28 available **CQ** issues are sold as a set for $34, postage paid.

Subscriptions to ***Whole Earth Review*** are $18 for one year (4 issues) and $33 for two years (8 issues). Foreign rates are $22 for one year and $41 for two years. Send your order with payment to: ***Whole Earth Review***, P. O. Box 15187, Santa Ana, CA 92705.

"Or Whole Earth Access"

That phrase under access information in ***Whole Earth Review*** means you can mail-order the item from the Whole Earth Access store. *Do not send orders for books to* ***Whole Earth Review***. Send orders to:

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Berkeley, CA 94710
415/845-3000;
800/845-2000

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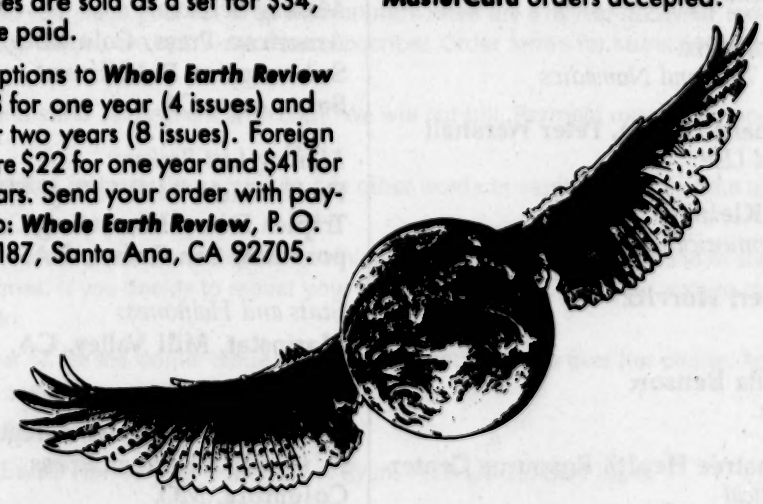

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Communications

Robert Horvitz
Art

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Film

Planetree Health Resource Center
Medical

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First Quarter (January-March) 1987

INCOME	
Subscriptions	$ 80,775
Back issues	1,049
Mailing list rental	7,296
Unclassifieds	1,388
Direct distribution	15,584
Dell (national newsstand)	17,766
Sales: EWEC	6,329
WESC	555
Best of CQ	390
Syndicated column	7,150
Royalties:	
CompuServe	387
Reprints	454
Contributions	1,848
Interest	276
Miscellaneous	6,002
Total Income:	**$ 147,249**

EXPENSES	
Salaries: Editorial	$ 17,881
Production	13,594
Circulation	13,750
Office	6,318
Research	2,657
Outside production services	512
Writers/contributors	7,910
Magazine printing	27,382
Subscription fulfillment	9,517
Circulation promotion	4,844
Direct distribution	1,049
Dell (national newsstand)	2,556
EWEC contributors	3,198
Mailing list rental	467
Fulfillment: EWEC	186
Best of CQ	0
Purchases: EWEC	2,513
WESC	888
Syndicated column	5,821
CompuServe	129
Apple project	1,703
Insurance:	
Workers' comp	178
General	711
Taxes:	
Payroll FICA	4,774
Other	660
Supplies/research	3,225
Equipment rent/maintenance	2,136
Telephone/networks	2,245
Postage	2,099
Auto/travel	30
Rent/maintenance/utilities	9,572
Legal/professional services	1,460
Interest/bank charges	3,381
Miscellaneous expenses	82
Total Expenses	**$ 153,428**
PROFIT/LOSS	**-6,179**

•

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Huey Johnson, Doug Carlston, Stewart Brand, Kevin Kelly

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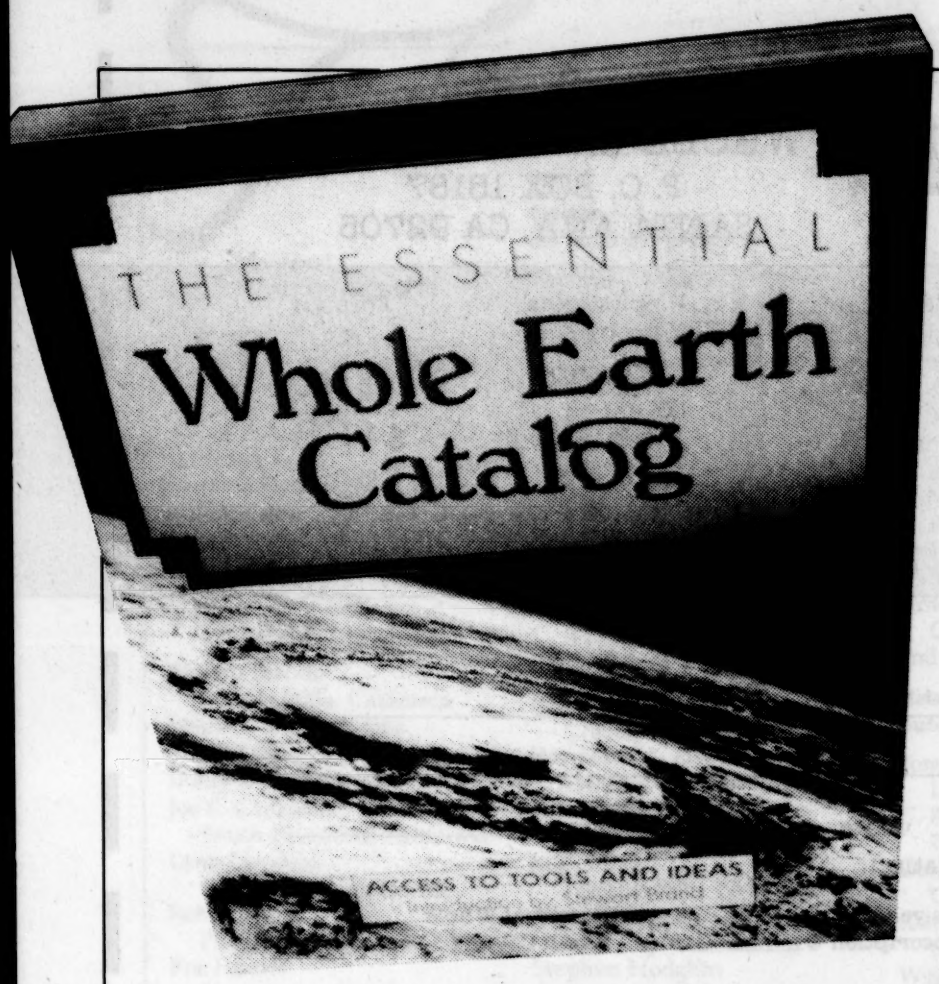

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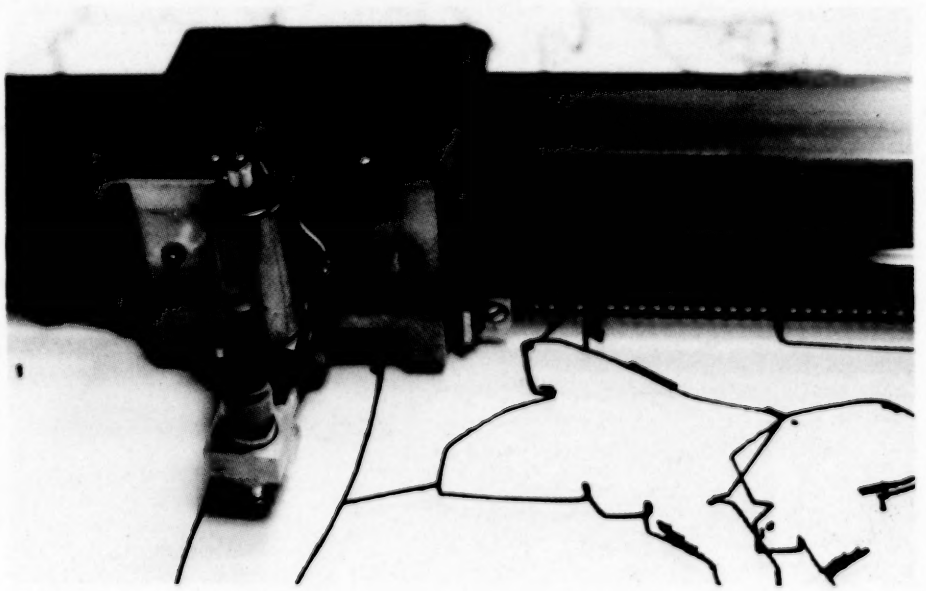

The hand of the artist? AARON's business end executes a drawing in pen and ink. Nobody, including Harold Cohen, knows what the drawing will look like until it's done.
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